SPECIFICATIONS

FOR

TERRA NOVA NATIONAL PARK
UTILITY SYSTEMS RECAPITALIZATION
PHASE 3

PARKS CANADA
TERRA NOVA NATIONAL PARK, GLOVERTOWN, NL

ISSUED FOR TENDER

PCA Project No.: 1716
Date: May 31, 2021

Specifications
Issued for Tender

PARKS CANADA
TERRA NOVA NATIONAL PARK
UTILITY SYSTEMS RECAPITALIZATION – PHASE 3
TERRA NOVA NATIONAL PARK

Standing Offer Agreement: 5P301-18-0001/001
PCA Project No.: 1716

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PARKS CANADA
TERRA NOVA NATIONAL PARK
UTILITY SYSTEMS RECAPITALIZATION
PHASE 3

TERRA NOVA NATIONAL PARK, Glovertown, NL

Crandall Engineering (A Division of Englobe Corp.) **Issued for Tender – Technical Specifications**						
	Prepared by	**Init**	**Date**	**Checked by**	**Init**	**Date**
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Project Manager	Andrew Melanson	AcM	May 31, 2021			

List of Drawings

PART 1 – GENERAL

1.1 Description of Work

.1 The work will be carried out within both the Newman Sound Campground and Malady Head Campground, as well as the Visitor Center in Terra Nova National Park in Glovertown, NL. It will include the replacement of all water and sewer mains and services east of the scope previously completed in Phase 2 (2020/21), as well as a new water reservoir in Newman Sound Campground. The project also includes the replacement of all septic fields and treatment systems as well as the addition of new water bottle filling stations in both Newman Sound and Malady Head Campgrounds as shown on the drawings. The work in Newman Sound will include all services and complete connections to the existing washrooms, kitchen shelters and other existing buildings. It will also include the installation of new water main and service pipe and connections at the Terra Nova National Park Visitor Center as well as the connection to/and retrofit of the pumps and equipment within the existing pumphouse.

.2 The work of this contract includes the provision of all materials, labour, equipment, and ancillaries, all as necessary for the completion of the work as indicated on the drawings and as described in the specifications and notes. Work on this project consists generally of, but is not limited to, the following:

.1 Supply and install all environmental protection measures where required such as site erosion and sediment control measures, check dams, silt fencing, vegetative stabilization and other measures, to be maintained for the duration of the project and removed following completion unless otherwise noted on the drawings.

.2 Supply and operation of traffic control and signage for the duration of the project where required.

.3 Excavation to expose existing buried utilities at all crossing locations as indicated on the drawings or required by the Departmental Representative and recording their location.

.4 Clearing as shown on the drawings only and as directed/approved by Departmental Representative.

.5 Supply and installation of new 65mm, 50mm and 38mm diameter DR-21 PVC (or approved equal) water main, 100mm diameter DR-18 PVC water main and 50mm, 38mm and 20mm diameter services by means of open trench excavation to the lengths indicated on the drawings and tender form, including but not limited to all fittings, pipe connections, structures, valves, valve boxes, chambers, etc. This work includes all necessary testing and disinfection of the new system.

.6 Supply and installation of new 150mm and 200mm diameter PVC DR-35 sanitary sewer and 100mm diameter service pipes by means of open trench excavation to the lengths indicated on the drawings and tender form, including but not limited to all fittings, pipe connections, manholes, structures, etc. This work includes all necessary testing of the new system as per the specifications.

.7 Supply and installation of new air release valves equipped with concrete valve chamber and all related appurtenances.

.8 Supply material and construct new fire hose boxes (cabinets) and standpipes (on 6” x 6” post) and all necessary fittings including, but not limited to the new 38mm and 20mm diameter PEX pipe, 38mm x 38mm x 20mm tee, 20mm hose bib, vacuum breakers, timber (fiberglass coated) fire hose box complete with ball valves for external (underground), valve boxes and drainage chamber as well as internal (fire hose) isolation

as per the attached detail drawings.

.9 Supply and installation of new water bottle filling stations complete with drainage chamber or low point drain as shown on the drawings.

.10 Supply and installation of new 125,000L Glass-Fused-to-Steel water storage reservoir complete with concrete foundation and level sensor system as shown on the drawings and in technical specifications.

.11 Removal and/or abandonment in place of existing water and sewer systems as shown on drawings. Existing infrastructure outside of the limits of the new work shall be abandoned in place. Existing fire hose boxes and service standpipes shall be removed and abandoned below grade after they are decommissioned regardless of being within the limits of the new work.

.12 Supply and install new prepackaged lift station, including new station, wetwell, duplex pumping system, all controls and removal and disposal of existing stations.

.13 Supply of all labour, material and equipment to construct new septic and/or advanced treatment systems including, but not limited to excavation, bedding, compacting, geotextile cover, pre-cast concrete septic tank, siphon chamber, blower units and weatherproof enclosure (building), complete electrical power connections, disposal pipe, distribution box, wall seals and complete disposal field as per the drawings.

.14 Common Excavation, hauling, placement and compaction of borrow aggregates and granular materials for bedding and surround as well as for crushed rock access roads or other road structures as shown on drawings.

.15 Placement of asphalt concrete and reclaimed asphalt pavement (RAP) and or granular materials required to

restore the roads following excavation and backfilling operations.

.15 All other labour, materials and work necessary to complete the project to the Departmental Representative's full satisfaction.

.3 All work to be carried out in accordance with applicable federal and provincial regulations for those agencies having jurisdiction for the work. The work is subject to the National Park Act and Regulations, Canadian Environmental Protection Act, Canada Labour Code and the NL Occupational Health and Safety Act and Regulations.

.4 The Contractor is advised that other construction work may be being performed by others at different locations within the National Park during the time frame of this contract. Contractor is to cooperate with other contractors within the project limits.

1.2 Work Restrictions

.1 The Contractor is limited to working within the contract limits and lay down areas shown on the drawings. The Contractor must acquire all necessary Clearing Permits and Construction Permits which must be approved by the Field Unit Superintendant (FUS). Work/clearing beyond these limits is prohibited unless otherwise directed by the Departmental Representative.

.2 The Contractor shall not carry out any work within 30m of any water course, reservoir or wetland without all necessary permits.

1.3 Familiarization With Site

.1 Before submitting a bid, it is recommended that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.

.2 The visits shall be coordinated, and the Contractors, bidders shall obtain prior permission from the Parks Canada Asset Manager before carrying out any such visits or site inspection.

.3 Contractors, bidders or those they invite to site are to review specification Section 01 35 29 – Health and Safety Requirements before visiting site. Take all appropriate safety measures, including Covid-19 safety procedures, for any visit to site, both before and after acceptance of bid.

1.4 Interpretation of Documents

.1 Supplementary to the Order of Precedence article of the General Conditions of the Contract, the Division 01 sections take precedence over the technical specification sections in other Divisions of the Specification Manual.

1.5 Setting Out Work

.1 The Departmental Representative will arrange for layout to be provided.

1.6 Measurement For Payment

.1 Notify Departmental Representative sufficiently in advance of operations to permit required measurements for payment.

1.7 Maintenance of Work During Construction

.1 Maintain work during construction. Undertake continuous and effective maintenance work, day by day, with adequate equipment and forces so that the water main, sewer main, services, structures, clearing limits and roads are continuously kept in a condition satisfactory to the Departmental Representative.

1.8 Codes and Standards

.1 Perform work in accordance with National Parks Act, Code of Practice of the Department of Labour, as it pertains to the Traffic Control Manual (Department of Transportation & Works) and any other code of federal, provincial or local

application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Materials and workmanship must conform to or exceed applicable standards of Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), American Society for Testing and Materials (ASTM) and other standards organizations.

.3 Conform to latest revision of any referenced standard as re-affirmed or revised to date of specification. Standards or codes not dated shall be deemed editions in force on date of tender advertisement.

1.9 Work Within Park Boundaries

.1 The project is located within a National Park and it is essential that lands remain as undisturbed as possible. The Contractor will be expected to use standards and methods beyond those for normal construction in order to protect the environment and ensure the aesthetics of the work. Contract limits shall be strictly adhered to and every precaution shall be taken to minimize environmental damage and disruption to vegetation, wildlife habitat, and structures or existing services, both on construction and storage sites.

.1 If any damage occurs during construction, the Contractor is responsible to bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If Contractor fails to repair damage to the satisfaction of the Departmental Representative, the Departmental Representative may have repairs completed by others at the Contractor's expense.

.3 The Contractor shall ensure that contracted work meets the standards outlined in the contract specification and drawings.

.4 The Contractor shall ensure that no

damage will be done to any existing underground telephone cables or other buried utilities.

.5 All sources of aggregate must be submitted to the Departmental Representative for approval at least two (2) weeks prior to the start of any work. Aggregate sources must be free of invasive species and capable of producing clean material to the satisfaction of the Departmental Representative.

.6 The Contractor is responsible to follow the Provincial requirements regarding the following:

.1 Pit and Quarry Guidelines

.2 Environmental Construction Practice specifications

.7 The Contractor will make arrangements with authorities or owners of private properties for quarrying and transporting materials and machinery over their properties and be responsible for obtaining and paying of fees.

1.10 Documents Required

.1 Maintain at job site, one copy each of following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed drawings.

.5 Change orders.

.6 Other modifications to Contract.

.7 Copy of approved work schedule.

.8 Approved Permits.

.9 Field test reports.

.10 Manufacturer’s installation and application instructions.

.11 Site specific Health and Safety Plan and other safety related documents.

.12 Other documents as stipulated elsewhere in the Contract Documents.

1.11 Site Conditions

.1 The Contractor will be responsible to visit the existing facilities and planned route to review existing site conditions.

.2 Existing geotechnical conditions can be

found in the attached report in Appendix B. Should contractors require additional geotechnical investigation this can be done by obtaining all the proper permits and approvals from Parks Canada and carrying out the work at their own expense.

1.12 Departmental Representative

.1 Departmental Representative will be assigned after contract award.

1.13 Work Schedule

.1 Provide to the Departmental Representative in writing and within five (5) working days after Contract award, a detailed construction schedule and traffic control plan. The schedule shall show proposed work to be undertaken and anticipated completion dates for each category of work.

1.14 Sanitary Services

.1 The Contractor shall provide and maintain sanitary facilities for the use of workers at locations specified by the Departmental Representative. Provision of sanitary facilities shall meet requirements of provincial government and municipal statutes and authorities.

1.15 Contractor's Use of Site

.1 Use of site: for execution of work within the provided right-of-way and those areas specified by the Departmental Representative.

.2 The Departmental Representative will specify the areas for work and storage.

1.16 Project Meetings

.1 Departmental Representative will arrange project meetings that are to occur, at minimum, every two (2) weeks and assume responsibility for setting times and recording and distributing minutes.

.2 After receiving the Contractor's schedule, traffic control plan, health and safety hazard assessment, and environmental protection plan, and prior to start of construction, a meeting involving Contractor, Departmental Representative and Parks Canada will be held at a place

and time to be determined by the Departmental Representative. This meeting will review implications of the contract, design, schedule of work health and safety, methods of construction, environment protection methods, lay down areas and traffic control.

.3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

.4 No work will begin until the pre-construction meeting is held, and all submittals have been approved.

.5 Following the pre-construction meeting and approval of submittals, the work will be carried out to meet the time restraints and have the project completed on time.

1.17 Existing Services

.1 Carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.

.3 Submit schedule to and obtain approval from Departmental Representative for any shut down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.5 Record locations of maintained, re-routed and abandoned service lines.

.6 Ensure pedestrian and other traffic is not unduly impeded, interrupted or endangered

by execution or presence of work.

.7 Maintain existing signs at all times. When it is necessary to temporarily remove a sign, it shall be dismantled and re-established on a temporary post or stand set back from construction area. The work is considered to be incidental and no separate payment will be made for maintaining or moving signs.

.8 Verify locations of any underground utilities.

1.18 Additional Drawings

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

1.19 National Historic Site

.1 The project is in a National Historic Site of Canada, standards for environmental protection and for visual aesthetics of final product shall be of a quality standard. Contract limits shall be strictly adhered to and Contractor is to take special care to minimize damage and disruption and protect existing features. The Departmental Representative is to be notified immediately if any historic or natural resources are discovered during construction.

.2 Buried Artifacts: Buried Artifacts, the remains and evidence of any ancient persons and peoples, and any objects shall be protected and immediately brought to the knowledge of the Departmental Representative. Should any archeological resources such as Indigenous or historical military artifacts and/or structural features, and/or human remains be uncovered, work must cease in the immediate area and the Parks Canada Project Manager be informed. The Project Manager will then notify Parks Canada's Terrestrial Archaeology section to assess the significance of the find and determine if further measures are required.

.3 Archaeologist: Archaeologist may be required to be on site to monitor work to ensure no archaeology resources are damaged. Advise Departmental Representative and implement direction.

1.20 Relics, Antiquities and Wildlife Habitat

.1 Protect relics, antiquities, wildlife habitat, items of historical or scientific interest such as cornerstones and contents, animal nesting sites, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Departmental Representative and await Departmental Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain the property of Canada.

1.21 National Park Act

.1 For projects within boundaries of National Park, perform work in accordance with Canada National Parks Act and Regulations.

1.22 Measurement of Quantities

.1 Linear: Items which are measured by metre are to be measured along centre line of installation. Lengths shall be in agreement with the Departmental Representative.

.2 Volume: Longitudinal and transverse measurements to be measured both horizontally and vertically to calculate a volume which shall be in agreement with the Departmental Representative.

.3 Weight:

.1 Where contract unit prices are for weight measure of material, the Contractor shall provide, install and maintain approved scales for the measurement of such materials. The scales shall be of sufficient capacity and dimension to fully contain the loaded vehicle. The scale

platform and mechanism shall be kept clean and in good working order at all times. The approach roadway shall be on a flat grade, level with the scale platform for at least one truck length.

.2 The scale shall be tested at the beginning of each construction season in accordance with the requirements of the Government of Canada prior to being used. The Certificate issued by the testing authority shall be displayed at the scales at all times.

.3 If the scales are moved, repaired or altered in any way, they shall again be tested and certified in accordance with Government of Canada requirements before additional use. Only original weight certificates from the quarry or pit of material origin will be accepted and used as basis for payment. Copies of weight certificates will not be accepted. Weight certificates are to be original digitally printed vouchers. Hand-written weight certificates and certificates other than those approved will not be accepted.

1.23 Permits/ Authorities (if required)

.1 The Contractor shall obtain, and pay for, permits from authorities as required for all operations and construction. He shall also comply with all pertinent regulations of all authorities having jurisdiction over the work. The Contractor shall provide copies of all permits to the Departmental Representative prior to starting the work. The Contractor shall be responsible for obtaining all applicable permits, inspections and approvals required and shall pay all charges in connection therewith.

1.24 Equipment Rental Rates

.1 Upon written request, the Contractor will supply the Departmental Representative with a list of the rental equipment to be used on work beyond the scope of bid items.

Equipment rental rates will be in accordance with current rates published by the Newfoundland and Labrador Department of Transportation and Works.

1.25 Existing Survey

.1 Topographic survey used in the preparation of these Contract Documents was provided by Crandall Engineering Ltd. (a Division of Englobe Corp.)

1.26 Protection

.1 Store all materials and equipment to be incorporated into work to prevent damage by any means.

.2 Repair and replace all materials or equipment damaged in transit or storage to the satisfaction of the Departmental Representative and at no cost to Canada.

.3 Contractor shall take adequate precautions to protect existing structures when operating tracked equipment.

.4 Exercise care so as not to obstruct or damage public or private property in the area.

.5 At completion of work, restore area to its original condition. Damage to ground and property will be repaired by Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to Departmental Representative.

END

PART 1 – GENERAL

1.1 Submittals

.1 Upon acceptance of bid and prior to commencement of work, submit to Departmental Representative the following work management documents:
- .1 Work Schedule as specified herein.
- .2 Health and Safety Plan as specified in Section 01 35 29 – Health and Safety Requirements.
- .3 Environmental Protection Plan as specified in Section 01 35 43 – Environmental Procedures.
- .4 Traffic Control Plan as specified in Section 01 55 26 – Traffic Regulation.

1.2 Work Schedule

The Contractor, once awarded the work, shall begin as soon as directed by the Departmental Representative and shall complete all works including demobilization and clean-up by July 22, 2022 (based on award date of July 26, 2021).

.1 The project shall begin on or about August 23, 2021 and be completed on or before July 22, 2022. Work in Newman Sound Campground shall not begin until at least September 7, 2021. The west portion of the Newman Sound campground (areas outside of this work scope as shown on the drawings) shall remain open during the work. Temporary water services shall be constructed as necessary in order to maintain water to this portion of the campground. Campground utility outages will be permitted between October 12, 2021 and May 20, 2022.

.2 The two (2) sanitary sewer septic systems and large advanced treatment system and their disposal fields located within Malady Head Campground, as well as the five (5) septic systems located in the east portion of Newman Sound Campground, associated with:
- Building #38 (Shall not begin until Oct 12, 2021)
- Buildings #29 and #30

- Buildings #27 and #28
- Building #26
- and Buildings #24 and #25

are priorities to begin immediately upon start-up to ensure that the campground is ready for start-up the following spring (prior to May 20, 2022). No obstruction to the camping season or visitor experience is permitted within Malady Head Campground.

.3 No work shall take place near, nor shall there be any disturbance to the public or utility disruptions to the west portion of Newman Sound Campground (areas outside of this work scope as shown on the drawings) between May 20, 2022 and October 10, 2022.

.4 The existing water reservoir at Newman Sound Campground shall remain in service until October 12, 2021. The new water reservoir at Newman Sound Campground shall be fully operational, including all necessary testing prior to May 8, 2022.

.5 Work performed in other areas during campground operating season (May 20, 2022 to October 10, 2022), shall only be permitted if requested and authorized by the Departmental Representative, and shall be restricted to one loop at a time.

.6 Upon acceptance of bid the Contractor shall submit:

.1 Preliminary work schedule within five (5) calendar days of contract award.

.7 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.

.8 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.

.9 Work schedule content to include as a minimum the following:
- .1 Bar (GANTT) Charts, indicating all work activities, tasks and other project elements, their anticipated durations, planned dates for achieving key activities and major project milestones supported with;
  - .1 Written narrative on key elements of work illustrated in bar chart, providing sufficient details to demonstrate a reasonable implementation plan for completion of project within designated time.
  - .2 Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.

.10 Work schedule must take into consideration and reflect the work phasing.

.11 Schedule work in cooperation with the Departmental Representative.

.12 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

.13 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.

.14 Schedule Updates:
- .1 Submit when requested by Departmental Representative.
- .2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.
- .3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be

taken.

.15 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.

.16 In every instance, any change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to tenant or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.3 Project Meetings

.1 Departmental Representative will schedule and administer project meetings every two (2) weeks for entire duration of work.

.2 Departmental Representative will prepare agenda for meetings.

.3 Meetings will be held at project site or as directed by Departmental Representative.

END

PART 1 - GENERAL

1.1 General Requirements

.1 The Form of Tender includes both lump sum priced items and several unit priced items.

.2 The total tendered price shall be the sum of the lump sum items plus the amounts calculated from the unit priced items based on the approximate quantities identified for each of the unit priced items.

.3 The Contractor in submitting their Tender for the project understands that they will only be entitled to payment under the unit priced items when prior written authorization has been received from the Departmental Representative for utilization and then only to the extent of the work authorized by the Departmental Representative.

.4 Additional instructions for measurement and/or payment for items of the work may be contained in specific sections of the Technical Specifications. In the case of a conflict between the instructions for measurement and payment contained in this section with that of any other section, the requirement of this section shall apply.

.5 The submitted tender prices will be inclusive of all costs for the complete supply and installation of all materials, labour and equipment required to complete the work. No separate payment will be made for any testing, inspections, and approvals required by the Contractor.

.6 All measurement shall be along a horizontal plane unless otherwise indicated.

1.2 Lump Sum Items

.1 There shall be no separate measurement for payment made for these lump sum items.

.2 General Contract Requirements:

.1 Method of Measurement: Percentage Complete as agreed by Departmental Representative and the Contractor.

.2 This item includes but is not limited to site maintenance, mobilization, demobilization, common excavation and backfill (if not specifically mentioned in other lump sum or unit price items), asbestos concrete pipe removal as necessary, removal of existing asphalt, roadway embankment and shoulder repairs and finishing, any temporary backfill required to maintain roads prior to construction of final road structure, dust control, replacement of existing pavement markings, temporary water services (if necessary), miscellaneous landscaping, French drain at Beach Cove in Malady Head, any and all ditching and environmental protection required and/or as shown on the drawings.

.3 Demolition of Wood Stave Reservoir

.1 Method of Measurement: Percentage Complete as agreed by the Departmental Representative and the Contractor.

.2 This item includes all equipment, personnel and work required for the complete demolition of the existing wood stave reservoir at the Newman Sound Campground including any posts, footings or foundation and proper disposal of these items from site. This work also includes the clean disconnection to the existing water main and

capping (if required) in preparation for the new connection.

.4 125,000L Water Reservoir:

.1 Method of Measurement: Percentage complete as agreed by Departmental Representative and the Contractor.

.2 This item shall include all items necessary to complete the work to construct the tank and foundation as shown on the drawings and detailed in the specification Section 33 11 17 "Glass-Fused-to-Steel Water Reservoir". This includes but is not limited to detailed design and fabrication of the 125,000L reservoir and concrete foundation, delivery of the tank to the project site, preparation and construction of the foundation, erection of the tank, all materials, coatings, seals, level control system, connection of the communication cables at water reservoir and existing pumphouse, stainless steel pipes, MJ x Flanged valves, overflow drain and drain outfall, check valves, mixing system, installation of electrical cables and connections, lightning protection, grounding system and environmental protection. This lump sum unit shall also include all required connections and testing/training for the operation and maintenance required on the tank and the removal and disposal outside of park at an approved facility.

.5 Packaged Sanitary Lift Station:

.1 Method of Measurement: Percentage complete as agreed by Departmental Representative and the Contractor.

.2 This item shall include all items necessary to complete the work to install the lift station as shown on the drawings and detailed in the specification Section 32 32 13 "Packaged Sewage Lift Station". This includes but is not limited to delivery of lift station to designated site, equipment and material, excavation, installation, pumps, wetwell, piping, valve system, control panel, electrical cables and connections, frame and cover, connections, gaskets, dewatering, bedding, compaction, backfilling, restoration and maintenance including the decommissioning and removal of existing lift station.

.3 The force main supply and installation will be paid in separate item under the unit price items.

.6 Septic Systems:

.1 Method of Measurement: Percentage Complete as agreed by Departmental Representative and the Contractor.

.2 This item includes the supply of all labour and material, excavation, dewatering, bedding, compacting, geotextile cover, delivery of pre-cast concrete septic tank to site, advanced treatment units and all related components (if required), blower building (if required), installation, siphon chamber, disposal pipe, distribution box(es), dosing chamber(s), wall seals, complete disposal field, backfilling, restoration and maintenance. This lump sum item shall also include the decommissioning and/or removal of existing septic tanks and

seepage pits. Also included in the lump sum price is all the electrical requirements including the cable and connections to feed the blower buildings (if required) as shown in the drawings.

.7 Visitor Centre Pumphouse Retrofit

.1 Method of Measurement: Percentage Complete as agreed by Departmental Representative and the Contractor.

.2 This item includes removal and replacement of existing pump, galvanized casing, bladder tanks, interior galvanized piping as well as all existing electrical and panel with new equipment and materials as shown on the drawings.

1.3 Unit Price Items

.1 Clearing, Grubbing and Stripping Stockpiling:

.1 Unit of Measurement: square metres (m^2), in place measurement, as agreed by Department Representative and the Contractor.

.2 This item includes: clearing and disposal of trees (standing and felled) and shrub vegetation within the clearing limits shown on the drawings as well grubbing, stripping and stockpiling of existing topsoil including ground level vegetation, underbrush, boulders and rock fragments as directed by Departmental Representative.

.2 Rock Excavation:

.1 Unit of Measurement: cubic meters (m^3), in place measurement, as agreed by Department Representative and the Contractor.

.2 Method of Measurement: Rock will be measured in its original position, by the average elevation above the bottom of pipe bedding (0.3m below the underside of pipe in rock) for a total width of 0.3m on each side of the pipe plus the pipe diameter), calculated by the length that it presents itself. For foundation work, rock will be measured to a width of 0.3m beyond the width of the foundation walls and 0.3 below the any footing for the length around the centre of the foundation wall. Additional rock removed within the trench outside of the above described cross section is considered incidental to the work and will not be measured for payment.

.3 This item includes: The supply of all material, equipment, and work required for rock removal excavation, shattering rock to a depth of 300 mm below the bottom of the new pipe elevation indicated on the drawings, measured as mentioned above, including loading and disposal of rock material off-site.

.3 Water Main Pipe:

.1 Unit of Measurement: Linear Meters (m). Based on field measurements for the length of each size and type Water Main pipe acceptably laid.

.2 This item includes all supply and transportation of materials, labour, excavation, installation of pipe including, bedding, marker tape, de-watering, backfill, granular materials, surface restoration (outside of roads), compaction and equipment required to remove all common excavation and stockpiling,

disposal of surplus material at approved locations and capping and abandonment in place of existing system.

.3 This item also includes all costs for pressure testing and disinfection as per the Specifications to the satisfaction of the Departmental Representative. Flushing, testing and disinfection point locations will be determined in the field by the Departmental Representative and all necessary equipment, pipe and fittings for these features, as well as their removal shall be incidental to the work.

.4 Where pipe is being installed below areas of road reconstruction, within the limits of the road, common (mass) excavation and backfill of the road structure only (granular B sub-base [if required], granular A base, or asphalt), shall not be incidental to the pipe price but shall be paid for under their individual unit quantities. All other excavation, backfill and surface restoration shall be incidental to the pipe unit price.

.4 Water Main Pipe Fittings:

.1 Unit of Measurement: Number of units per fittings and size diameter acceptably installed as agreed by Departmental Representative and the Contractor. Quantities and sizes shown on combined price form are to be used as a guide only. The Contractor is responsible to have all appropriate fittings available for necessary connections on site. End caps and other fittings not mentioned

below, but required to complete the project, are considered incidental to the work.

.2 This item includes all supply and transportation of materials, labour, and equipment required for the installation of pipe fittings including bends, tees, crosses and reducers, adapters, end caps, and any required joint restrainers and/or glue. This item includes only the fittings on the DR-18, DR-21 PVC or PEX mainline Water Main. All payment for fittings downstream of the main tee on service lateral pipes shall be included in the unit prices of other items.

.5 Water Service Lateral Pipe:

.1 Method of Measurement: Linear meters (m) acceptably installed as agreed by Department Representative and the Contractor.

.2 This item includes the supply and transportation of all materials, labour, and equipment for the installation of water service lateral pipes (PEX pipe) and pipe used for fire hose boxes, service stand pipes or water bottle filling stations as shown on the drawings including, but not limited to stripping and re-use of top-soil, excavation, bedding, piping, backfilling, compaction, trench restoration and maintenance, capping and abandonment of existing system and all work incidental thereto.

.3 Where pipe is being installed below areas of road reconstruction, within the limits of the road, common (mass) excavation and backfill of the road structure only (granular B sub-base, granular A base, or asphalt), shall not be

incidental to the pipe price but shall be paid for under their individual unit quantities. All other excavation, backfill and surface restoration shall be incidental to the pipe unit price.

.6 Water Service Lateral Pipe Appurtenances (for buildings, kitchen shelters, service standpipes, and water bottle filling station locations):

.1 Method of Measurement: Number of units acceptably installed as agreed by Departmental Representative and the Contractor.

.2 This item includes the supply and transportation of all materials, labour, and equipment required for the complete water service connection to new or existing buildings, kitchen shelters, service standpipes, firehose boxes and water bottle filling stations including, but not limited to the connections, couplings, vertical sections of pipe, fittings, saddles, tees, main stops, curb stops and curb boxes for a connection to the water main pipe with a PEX, and not limited to couplings for material/size transitions (adaptors), fittings, curb stops and curb boxes for a connection to the PVC DR-21, Sch.40 PVC, copper, or other water service lateral pipe or caps for future connections to buildings, kitchen shelters or water bottle filling stations.

.7 Air-Release Valves and Chamber:

.1 Method of Measurement: Number of units acceptably installed as agreed by Departmental Representative and the

Contractor.

.2 This item includes supply of 25mm or 20mm diameter air release valve and all labour, excavation, de-watering, backfill, bedding/backfill materials and equipment required to install the valve, saddle, main stop, 100mm diameter vent piping, vent and drainpipe, and cast in place (or pre-cast) concrete chamber c/w frame and cover. Chamber to be set on the cast in place concrete pads and insulated as shown on the drawings.

.8 Valves:

.1 Method of Measurement: Number of units acceptably installed as agreed by Departmental Representative and the Contractor.

.2 This item includes the supply of the valve and all labour, excavation, de-watering, backfill, bedding/backfill materials and equipment required to install a 100mm, 65mm or 50mm diameter gate valve (or other type if necessary) complete with valve box and joint restrainers. The item also includes all main stops, service saddles and any temporary pipe required for flushing, testing and disinfection points if required outside of valve box. Flushing, testing and disinfection points will be determined in the field with the Departmental Representative and are considered incidental to the work.

.9 Low Point Drain Outlet:

.1 Method of Measurement: Number of units acceptably installed as

agreed by Departmental Representative and the Contractor.

.2 This item includes but is not limited to the supply of low point drain outlet, screen on end of pipe or check valve, geotextile fabric beneath rip-rap, daylighting pipe to have positive drainage and all labour, excavation, de-watering, bedding, installation, backfilling, compaction, trench restoration and maintenance and all work incidental thereto.

.3 Rip-Rap, pipe, valve and tee for low point drain will be paid for under their separate unit prices.

.10 Insulation:

.1 Unit of Measurement: square metre (m2)

.2 Method of Measurement: Measurement of insulation shall be the number of square metres acceptably installed at the specified width and thickness.

.3 This item includes: the supply, installation and transportation of all equipment, labour and material, preparation, insulation, tape, additional bedding material above the insulation, clean-up and disposal of excess materials, and all work incidental thereto, all as specified or shown on the Drawings or as laid out by the Departmental Representative.

.11 Service Standpipe, Fire Hose Boxes (combination or stand-alone) and Water Bottle Filling Stations:

.1 Method of Measurement: Number of units acceptably installed as agreed upon with Departmental Representative and the Contractor.

.2 This item includes: a complete service stand pipe, fire hose box unit or water bottle filling station as shown on the drawings, which includes but is not limited to the HDPE drainage chamber(s) and cover, ball valves, tee, hose bib and vacuum breaker, vertical and above ground portion of PEX pipes, 6” x 6” post for service standpipe, fire hose box complete with cast-in-place concrete slab, fiberglass coatings, exterior wall, standpipe, bends, fire hose clamp and all necessary fittings, excavation, stripping, stockpiling, and re-using of topsoil following backfilling.

.3 The PEX pipe required for standpipe and/or fire hose boxes or water bottle filling stations installed horizontally, underground will be paid separately under its own unit price item under Water Service Lateral Pipe.

.4 Water bottle filling stations shall include the vertical PEX pipe required and/or the complete supply, installation and connection to the new water bottle filling stations at the locations shown on the drawings including but not limited to the concrete slab, the drainage pipes and/or HDPE drainage chambers.

.12 Sanitary Sewer Main:

.1 Unit of Measurement: Linear Meters (m). Based on field measurements for the length of each size of Sewer Main pipe acceptably laid.

.2 This item includes all supply and transportation of materials, labour, stripping and re-use of top-soil, excavation,

installation of pipe including connections, end caps, connections to existing manholes, marker tape, compaction, couplings, ends and fittings, de-watering, backfill, bedding/backfill granular materials and equipment required to remove all common excavation and stockpiling and disposal of surplus material at approved locations. This item also includes all costs for flushing, capping and abandonment of existing system, testing and video inspection as per the specifications and to the satisfaction of the Departmental Representative.

.3 Where pipe is being installed below areas of road reconstruction, within the limits of the road, common (mass) excavation and backfill of the road structure only (granular B sub-base, granular A base, asphalt, or asphalt millings), shall not be incidental to the pipe price but shall be paid for under their individual unit quantities. All other excavation, backfill and surface restoration shall be incidental to the pipe unit price.

.13 Sanitary Service Lateral Pipe:

.1 Method of Measurement: Liner meters (m) acceptably installed as agreed by Department Representative and the Contractor.

.2 This item includes the supply and transportation of all materials, labour, and equipment for the installation of sanitary service lateral pipes including, but not limited to stripping and re-use of top-soil, excavation, bedding, backfilling, compaction, trench

restoration and maintenance, capping and abandonment of existing system and all work incidental thereto.

.3 Where pipe is being installed below areas of road reconstruction, within the limits of the road, common (mass) excavation and backfill of the road structure only (granular B sub-base, granular A base, asphalt, or asphalt millings), shall not be incidental to the pipe price but shall be paid for under their individual unit quantities. All other excavation, backfill and surface restoration shall be incidental to the pipe unit price.

.14 Sanitary Service Lateral Pipe Connection (for buildings):

.1 Method of Measurement: Number of units acceptably installed as agreed by Departmental Representative and the Contractor.

.2 This item includes the supply and transportation of all materials, labour, and equipment required for the connection of sanitary service lateral pipes including, but not limited to fittings, bends, connection, caps for ends, saddle and tee.

.15 Sanitary Pressure Pipe:

.1 Unit of Measurement: Linear Meters (m). Based on field measurements for the length of Sewer Pressure Pipe acceptably laid.

.2 This item includes all supply and transportation of materials, labour, stripping and re-use of top-soil, excavation, installation of 65mm diameter pressure pipe including mechanical restraints on all

joints, marker tape, couplings, ends and fittings, de-watering, backfill, bedding/backfill granular materials, compaction and equipment required to remove all common excavation and stockpiling, capping and abandonment of existing system and disposal of surplus material at approved locations. This Item also includes all costs for flushing and testing as per the specifications and to the satisfaction of the Departmental Representative.

.16 Sanitary Sewer Manholes:

.1 Method of Measurement: Number of units of each type and size installed as agreed by Departmental Representative and the Contractor.

.2 Measurement for this item shall include supply and transportation of all labour, equipment and material, excavation, installation, manhole structure, flat-top section, frame and cover, cutting of pipes, gaskets, couplings, fittings including plugs and caps, grout, connections, dewatering, bedding, compaction, backfilling, leakage testing, adjustments, benching, inside drop (including drop bowl assembly with pipe if required), concrete benching, supports, adjustments, trench restoration and maintenance, clean-up and all work incidental thereto, all as specified or as shown on the drawings, or as laid out by the Department Representative.

.17 Mass Excavation, Roads:

.1 Unit of Measurement: Cubic metre (m3)

.2 Method of Measurement: This item shall be measured, based on

volumes calculated by the average end area method for material acceptably excavated. The top elevations used in calculations shall be the elevations taken after grubbing operations and stripping. If the material is suitable for re-use (as determined by the Departmental Representative), stock-piling, material re-used or disposal of surplus stock-piled material and environmental protection will be included in the excavated volume measured and will not be measured for separate payment.

.3 This item includes: the supply and transportation of all labour, equipment and material, excavation, shoring if required, dewatering, re-use of material, removal and disposal of unsuitable or excess material, environmental protection, compaction, grading and fine grading, and all work incidental thereto as shown on the Drawings or as specified herein or as directed by the Departmental Representative. Excavation required for the installation of pipes and structures is included in the price of pipes and structures, and will not be measured for separate payment under this item. Any other mass excavation required outside of the roads and pipe trenches is to be considered incidental to the work and costs shall be carried in General Contract Requirements (lump sum item).

.18 Granular “A” Base Material:

.1 Unit of Measurement: Tonnes (t)

.2 Method of Measurement: This item shall be measured by weight in tonnes of Granular Base Material

delivered and installed as road foundation on site. Truck slips indicating material weight will be collected for each load.

.3 This item includes: supply, placement, hauling and compaction and fine grading of granular materials for roadway granular base to the thickness shown on the drawings or as required by the Departmental Representative.

.19 Asphalt Concrete:

.1 Unit of Measurement: Tonnes (t)

.2 Method of Measurement: This item shall be measured by weight in tonnes of Asphalt (both surface course and base course [if required]) delivered and installed on site. Truck slips indicating material weight will be collected for each load.

.3 This item includes: supply, placement, hauling and compaction of asphalt as well as milling keyway at the transition to existing asphalt and any bituminous tack required for areas which require asphalt restoration. This item shall also include QC testing required by the Contractor as per the Newfoundland and Labrador Department of Transportation and Works Specifications Book (latest edition).

.20 Asphalt Cold Milling

.1 Unit of Measurement: Square Meters (m^2). Based on field measurements for fully milled surfaces or partially milled surfaces beyond cuts required in the existing asphalt for the installation of the new water main or sanitary sewer.

.2 This item includes all equipment, personnel and work required for the excavation of existing asphalt, cutting, necessary milling for a 40mm deep keyway (600mm wide) beyond the edge of the trench along any paved surfaces.

.21 Rip-Rap:

.1 Unit of Measurement: Tonnes (t)

.2 Method of Measurement: This item shall be measured by weight in tonnes of Rip-Rap delivered and installed on site. Truck slips indicating material weight will be collected for each load.

.3 This item includes: hauling, supply and placement of 200mm (10kg by mass) Rip-Rap to the dimensions shown on the drawings or as required in the field as directed by the Departmental Representative. There shall be no additional payment for extra thickness of materials or material placed outside of limits.

.22 Pipe Culverts

.1 Unit of Measurement: Lineal Metre

.2 Method of Measurement: Along centerline of pipe from end to end.

.3 This item includes supply of the culvert pipe all labour, excavation, de-watering, by-pass pumping, backfill, bedding/backfill materials and equipment required to install the culvert pipe shown on the drawings.

.23 Re-use of previously stripped topsoil

.1 Unit of Measurement: square metres

.2 Method of Measurement: Based on field measurements for square

metres of previously stripped topsoil acceptably placed.

.3 This item includes: re-use of stripped topsoil including stockpiling, disposal of unsuitable or excess material, loading, transportation and spreading and clean-up of storage sites and all work incidental thereto.

.24 Re-use of stockpiled grubbed material

.1 Unit of Measurement: square metres

.2 Method of Measurement: Based on field measurements for square metres of previously grubbed material acceptably placed.

.3 This item includes: re-use of grubbed material including stockpiling, disposal of unsuitable or excess material, loading, transportation and spreading and clean-up of storage sites and all work incidental thereto.

.25 Imported Topsoil

.1 Unit of Measurement: square metres

.2 Method of Measurement: Based on field measurements for square metres of imported topsoil acceptably placed.

.3 This item includes: supply and transportation of all labour, equipment, and materials, preparation, soil amendments, mixing, grading, imported topsoil, distributing, fertilizer, rolling, clean-up and all work incidental thereto, all as specified or as shown on the drawings or as laid out and approved by the Departmental Representative.

.26 Sodding

.1 Unit of Measurement: square metres

.2 Method of Measurement: Based on field measurements for square metres of sodding acceptably placed.

.3 This item includes: supply and transportation of all labour, equipment, and materials, preparation, grading, soil amendments, mixing, distributing, sod, cutting and trimming, mesh and pegs where required, rolling, maintenance including cutting and watering, re-sodding as directed, clean-up and all work incidental thereto, all as specified or as shown on the drawings of as laid out by the Departmental Representative.

.27 Gravel Driveway/Campsite Restoration

.1 Unit of Measurement: square metres.

.2 Method of Measurement: Based on field measurements for square metres of gravel driveway or campsite entrance acceptably restored.

.3 This item includes: supply and transportation of all equipment, labour and materials, spreading, grading, compaction, clean-up and all work incidental thereto. Granular base can be used in areas where the existing driveway/campsite is crushed stone.

.28 All and any items not specifically included in the unit price items are considered incidental to the work and are to be included in the lump sum portions of the work.

END

PART 1 - GENERAL

1.1 Administrative

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify that field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by

Departmental Representative's review.

.10 Keep one reviewed copy of each submission on site.

1.2 Shop Drawings and Product Data

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow five (5) days for Departmental Representative to review each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested. Accompany submissions with transmittal letter, in duplicate, containing:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Identification and quantity of each shop drawing, product data and sample.
.5 Other pertinent data.

.7 Submissions include:
.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.8 After Departmental Representative's review, distribute copies.

.9 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections or hard copies as Departmental Representative may reasonably request.

.10 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental

Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
- .2 Testing must have been within three (3) years of date of contract award for project.

.12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.13 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Documentation of the testing and

verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.15 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Delete information not applicable to project.

.17 Supplement standard information to provide details applicable to project.

.18 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.19 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for

information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 Samples

.1 Submit for review samples in triplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 Certificates and Transcripts

.1 Immediately after award of Contract, submit Workplace NL status.

.2 Submit transcription of insurance immediately after award of Contract.

END

PART 1 – GENERAL

1.1 Section Includes

.1 Fire Safety Requirements.

.2 Hot Work Permit.

.3 Existing Fire Protection and Alarm Systems.

1.2 Related Sections

.1 Section 01 35 29: Health and Safety Requirements.

1.3 References

.1 National Fire Code 2010

.2 National Building Code 2010

1.4 Definitions

.1 Hot Work defined as:
- .1 Welding work.
- .2 Cutting of materials by use of torch or other open flame devices.
- .3 Grinding with equipment which produces sparks.
- .4 Use of open flame torches such as for roofing work.

1.5 Submittals

.1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within fourteen (14) calendar days of acceptance of bid.

.2 Submit in accordance with Section 01 33 00 – Submittal Procedures.

1.6 Fire Safety Requirements

.1 Implement and follow fire safety measures during Work. Comply with following:
- .1 National Fire Code 2010.
- .2 National Building Code 2010.
- .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.7 Hot Work Authorization

.1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot Work on site.

.2 To obtain authorization submit to Departmental Representative:
- .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
- .2 Description of the type and frequency of Hot Work required.
- .3 Sample Hot Work Permit to be used.

.3 Upon review and confirmation that effective fire safety measures will be implemented and followed during performance of hot work, Departmental Representative will give authorization to proceed as follows:
- .1 Issue one (1) written "Authorization to Proceed" covering the entire project for duration of work or;
- .2 Subdivide the work into pre-determined, individual activities, each activity requiring a separately written authorization to proceed.

.4 Requirement for individual authorization will be based on:
- .1 Nature or phasing of work;
- .2 Risk to Facility operations;
- .3 Quantity of various trades needing to perform hot work on project or;
- .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.

.5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.

.6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of the Facility. Follow Departmental Representative's directives in this regard.

1.8 Hot Work Procedures

.1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.

.2 Hot Work Procedures to include:
- .1 Requirement to perform hazard assessment of site and immediate work area beforehand for each hot work event in accordance with Safety Plan specified in Section 01 35 29 – Health and Safety Requirements.
- .2 Use of a Hot Work Permit system with individually issued permit by Contractor's Superintendent to worker or subcontractor granting permission to proceed with Hot Work.
- .3 Permit required for each Hot Work event.
- .4 Designation of a person on site as a Fire Safety Watcher responsible to conduct a fire safety watch for a minimum duration of sixty (60) minutes immediately following the completion of the Hot Work.
- .5 Compliance with fire safety codes, standards and occupational health and safety regulations specified.
- .6 Site specific rules and procedures in force at the site as provided by the Facility Manager.

.3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Label document as being the Hot Work Procedures for this contract.

.4 Procedures shall clearly establish responsibilities of:
- .1 Worker performing hot work,
- .2 Person issuing the Hot Work Permit,
- .3 Fire Safety Watcher,
- .4 Subcontractor(s) and Contractor.

.5 Brief all workers and subcontractors on Hot Work Procedures and of Permit system. Stringently enforce compliance.

1.9 Hot Work Permit

.1 Hot Work Permit to include the following:
- .1 Project name and project number;

.2 Building name and specific room or area where hot work will be performed;
.3 Date of issue;
.4 Description of hot work type needed;
.5 Special precautions to be followed, including type of fire extinguisher needed;
.6 Name and signature of permit issuer.
.7 Name of worker to which the permit is issued.
.8 Permit validity period not to exceed eight (8) hours. Indicate start time/date and termination time/date.
.9 Worker's signature with time/date of hot work completion.
.10 Stipulated time period of safety watch.
.11 Fire Safety Watcher’s signature with time/date.

.2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.

.3 Each Hot Work Permit to be completed in full, signed and returned to Contractor's Superintendent for safe keeping on site.

1.10 Fire Protection And Alarm Systems

.1 Fire protection and alarm systems shall not be:
.1 Obstructed.
.2 Shut-off, unless approved by Departmental Representative.
.3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Costs incurred, from the fire department and Facility owner, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.11 Documents on Site

.1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.

.2 Upon request, make available to Departmental

Representative or to authorized safety Representative for inspection.

END

PART 1 – GENERAL

1.1 Definitions

.1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

.2 Competent Person: means a person who is:
- .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
- .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
- .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.

.3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

.4 PPE: personal protective equipment
- .1 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.2 Submittals

.1 Make submittals in accordance with Section 01 33 00.

.2 Submit site-specific Health and Safety Plan (including protocols and safe work procedures related to COVID-19) prior to commencement of Work.
- .1 Submit within 10 work days of notification of Bid Acceptance. Provide 3 copies.
- .2 Departmental Representative will review Health and Safety Plan and provide comments.
- .3 Revise the Plan as appropriate and resubmit within 10 work days after receipt of comments.
- .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall

responsibility for Occupational Health and Safety of the Work.

.5 Submit revisions and updates made to the Plan during the course of Work.

.3 Submit name of designated Health & Safety Site Representative and support documentation specified in the Safety Plan.

.4 Submit building permit, compliance certificates and other permits obtained.

.5 Submit documents/reports created by the Contractor during the work that may be reasonably requested by the Departmental Representative.

.6 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other department of labour organization.

.1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.

.7 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.8 Submit copies of incident reports.

.9 Submit WHMIS MSDS - Material Safety Data Sheets.

1.3 Compliance Requirements

.1 Comply with Occupational Health and Safety Act for Province of Newfoundland and Labrador, and Occupational Health & Safety Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations (COSH) as well as any other regulations made pursuant to the Act.

.1 The Canada Labour Code can be viewed at: www.http://laws.justice.gc.ca/en/L-2/

.2 COSH can be viewed at: www.http://laws.justice.gc.ca/eng/SOR-86-304/n e.html

.3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: (819) 956-4800 (1-800-635-7943) Publication No. L31-

85/2000 E or F)

.3 Observe construction safety measures of:
- .1 Part 8 of National Building Code
- .2 Provincial Worker's Compensation Board.
- .3 Municipal by-laws and ordinances.

.4 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.

.5 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

.6 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

.7 Comply with all works outlined in the Department of Transportation and Works, Traffic Control Manual, Revised April 2014.

1.4 Responsibility

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons and environment adjacent to the site to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to Work Site with safety requirements of Contract Documents, applicable federal, provincial, and local by-laws, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.5 Site Control and Access

.1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.

- .1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.

.2 Isolate Work Site from other areas of the premises by use of appropriate means.

.1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment. See Section 01 56 00 – Temporary Barriers and Enclosures for minimum acceptable requirements.

.2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.

.3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.

.3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. Provide security guard where adequate protection cannot be achieved by other means.

1.6 Protection

.1 Give precedence to safety and health of persons and protection of environment over cost and schedule considerations for Work.

.2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.7 Filing of Notice

.1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.

.1 Departmental Representative will assist in locating address if needed.

1.8 Permits

.1 Post permits, licenses and compliance certificates, specified in section 01 11 00 – General Instructions, at Work Site.

.2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

1.9 Hazard Assessments

.1 Perform site specific health and safety hazard assessment of the Work and its site.

.2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and subcontractors arrive on site.

.3 Before persons are granted access to site they must be made aware of all hazards.

.4 Record results and address in Health and Safety Plan.

.5 Keep documentation on site for entire duration of the Work.

1.10 Project/Site Conditions

.1 Following are potential health, environmental and safety hazards at the site for which Work may involve contact with:

.1 Known latent site and environmental conditions:
- .1 Steep slopes and rock faces.
- .2 Streams, brooks and other water bodies.
- .3 Wildlife.
- .4 Work around raw wastewater.

.2 Facility on-going operations:
- .1 Highway traffic.

.2 Above items shall not be construed as being complete and inclusive of potential health and safety hazards encountered during Work.

.3 Include above items in the hazard assessment of the Work.

1.11 Meetings

.1 The Contractor shall coordinate and chair a

pre-construction health and safety meeting, prior to commencement of Work, at time, date and location acceptable to the Departmental Representative. Ensure attendance of:

.1 Superintendent of Work
.2 Designated Health & Safety Site Representative
.3 Subcontractors

.2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.

.3 Keep documents on site.

1.12 Health and Safety Plan

.1 Prior to commencement of Work, develop written Health and Safety Plan and Safety Control Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.

.2 Health and Safety Plan shall include the following components:

.1 List of health risks and safety hazards identified by hazard assessment.
.2 Control measures used to mitigate risks and hazards identified.
.3 On-site Contingency and Emergency Response Plan as specified below.
.4 On-site Communication Plan as specified below.
.5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
.6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.

.3 On-site Contingency and Emergency Response Plan shall include:

.1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
.2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire

drills, location of fire fighting equipment and other related data.

.3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.

.4 Emergency Contacts: name and telephone number of officials from:

.1 General Contractor and subcontractors.

.2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.

.3 Local emergency resource organizations.

.5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PCA and Facility Management contacts.

.4 On-site Communication Plan:

.1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.

.2 List of critical work activities to be communicated with Facility Manager which have a risk of endangering health and safety of Facility users.

.5 Address all activities of the Work including those of subcontractors.

.6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.

.7 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.

.8 Post copy of the Plan, and updates, prominently on Work Site.

1.13 Safety Supervision

.1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work. Representative to be trained in occupational health and safety procedures and practices.

.2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
- .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work.
- .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
- .3 Conduct site safety orientation session to persons granted access to Work Site.
- .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
- .5 Stop the Work as deemed necessary for reasons of health and safety.

.3 Health & Safety Site Representative must:
- .1 Be qualified and competent person in occupational health and safety.
- .2 Have site-related working experience specific to activities of the Work.
- .3 Be on Work Site at all times during execution of the Work.

.4 All supervisory personnel assigned to the Work shall also be competent persons.

.5 Inspections:
- .1 Conduct regularly scheduled safety inspections of the Work on a minimum bi-weekly basis. Record deficiencies and remedial action taken.
- .2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.
- .3 Follow-up and ensure corrective measures are taken.

.6 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.

.7 Keep inspection reports and supervision related documentation on site.

1.14 Training

.1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.

.2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.

.3 When unforeseen or peculiar safety-related hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.15 Minimum Site Safety Rules

.1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:

.1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses, hearing protection and high-visibility workwear.

.2 Immediately report unsafe condition at site, near-miss accident, injury and damage.

.3 Maintain site and storage areas in a tidy condition free of hazards causing injury.

.4 Obey warning signs and safety tags.

.2 Brief persons of disciplinary protocols to be taken for non-compliance. Post rules on site.

1.16 Correction of Non-Compliance

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.17 Incident Reporting

.1 Investigate and report the following incidents to Departmental Representative:
- .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
- .2 Medical aid injuries.
- .3 Property damage in excess of $10,000.00,
- .4 Interruptions to Facility operations resulting in an operational lost to a department in excess of $5000.00.

.2 Submit report in writing.

1.18 Hazardous Products

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).

.2 Keep MSDS data sheets for all products delivered to site.
- .1 Post on site.
- .2 Submit copy to Departmental Representative.
- .3 For interior work in an occupied Facility, post additional copy in one or more publically accessible locations.

1.19 Blasting

.1 Blasting or other use of explosives is not permitted on site without prior receipt of written permission and instructions from Departmental Representative.

1.20 Powder Actuated Devices

.1 Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

1.21 Confined Spaces

.1 Abide by occupational health and safety regulations regarding work in confined spaces.

.2 Obtain an Entry Permit in accordance with Part XI of the Canada Occupational Health and Safety Regulations for entry into an existing identified confined space located at the Facility or premises of Work.
- .1 Obtain permit from Facility Manager

.2 Keep copy of permit issued.

.3 Safety for Inspectors:
.1 Provide PPE and training to Departmental Representative and other persons who require entry into confined space to perform inspections.
.2 Be responsible for efficacy of equipment and safety of persons during their entry and occupancy in the confined space.

1.22 Site Records

.1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.

.2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.

1.23 Posting of Documents

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on Work Site in accordance with Acts and Regulations of Province having jurisdiction.

.2 Post other documents as specified herein, including:
.1 Site specific Health and Safety Plan
.2 WHMIS data sheets
.3 Incident reports
.4 Tool box and safety meeting minutes

1.24 Scalehouse

.1 Ensure Scalehouse is a sufficient distance away from scales to prevent roll-over accidents.

.2 Ensure scalehouse is equipped with washroom facilities and air conditioning/heat.

END

PART 1 - GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Related Sections

.1 Section 01 35 45 – Environmental Protection Refueling Vehicles.

.2 Section 01 74 21 – Constructional Demolition Management and Disposal.

.3 Appendix E – Basic Impact Analysis

1.3 Fires

.1 Fires and burning of rubbish on site not permitted.

1.4 Disposal of Wastes

.1 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

.3 Dispose of uncontaminated construction/demolition material which cannot be recycled or reused, at an approved construction and debris disposal site.

.4 The disposal/storage/use/recycling of these materials shall be in compliance with all Federal, Provincial and Municipal Regulations and Requirements.

.5 All waste/surplus/recyclable materials removed from site becomes property of the Contractor.

1.5 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 Site Clearing and Plant Protection

.1 No vegetation clearing will be permitted between May 1st and August 15th due to annual songbird nesting season.

.2 Protect trees and plants on site and adjacent properties where indicated.

.3 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Minimize stripping of topsoil and vegetation.

.6 Restrict vegetation removal to areas indicated or designated by Departmental Representative.

.7 Vegetation and topsoil should not be removed to obtain fill for road construction purposes.

.8 Whenever possible, organic debris removed during grading operations should be stored for re-use during site restoration. Such stockpiles should be located well away from any stream or water body and should be covered with coarse material or tarps to minimize wind and water erosion.

1.7 Work Adjacent to Waterways

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material without Departmental Representative's approval.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.7 Temporary diversion ditches, approved by the Departmental Representative, are to be plastic lined.

.8 Temporary storage sites for debris generated from clearing operations should be deposited away from watercourses and should be surrounded by a natural vegetative buffer.

.9 Do not pump or drain water containing suspended materials into waterways. Water containing suspended materials shall be pumped into vegetation a minimum of 30 m away from watercourses.

1.8 Pollution/Dust Control

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads or roads

under construction. Chemicals used in dust control must have prior approval of the Departmental Representative.

1.9 General Requirements

.1 Work under this contract is to be carried out in a National Park, and environmental protection must be given a high priority by all staff involved with the work. Perform work in accordance with Canada National Parks Act and Regulations.

.2 An Environmental Briefing will be held prior to work commencing at the site, which will outline environmental factors to be considered during the work. It is mandatory that all current staff of the Contractor attend this meeting with the Departmental Representative and Environmental Protection Officer (EPO).

.3 The Contractor shall meet all requirements as detailed in Appendix E – Basic Impact Analysis (BIA) Terra Nova National Park Utility Systems Recapitalization – Phase 3. This document is not all-inclusive, and site adjustment of the mitigation methods for the work may be required. The Departmental Representative will advise the Contractor of any additional requirements as they arise.

.4 The Contractor to ensure that all equipment entering the site be cleaned to prevent potentially invasive species of plants from being transported into the National Park from previous projects.

1.10 Site Set-up and Use

.1 All site activities related to construction are to be confined within the defined project boundaries.

.2 Work sites must be equipped with appropriate and properly maintained sanitary facilities.

.3 Garbage must be collected and removed daily from the work site. All material must be removed, transported and disposed of in

accordance with existing provincial – municipal and Park solid waste disposal guidelines and/or regulations.

.4 Littering is prohibited.

.5 Temporary storage, parking areas, and turn-a-round facilities for contractor-related equipment and vehicles will be limited to those areas agreed to and designated by the Departmental Representative.

1.11 Environmental Protection Plan

.1 The Contractor is required to submit a plan showing all pollution control measures that will be used to fulfill the requirements of the Environmental Protection Section. This plan will be reviewed by the Departmental Representative and the Environmental Protection Officer prior to commencement of any work. Any deviation from this plan will require further approval by the Departmental Representative. The protection plan shall be submitted prior to the pre-construction meeting.

.2 The Environmental Plan will outline how the Contractor will address the environmental protection requirements, including the installation of pipes and culverts, cleaning equipment prior to entering the site. It will show sufficient detail on products to be used and physical placement on site to determine effectiveness of these items.

.3 The plan must cover all activities within the limits of all construction, laydown and traffic diversion areas.

1.12 Environmental Performance

.1 The Contractor is required to follow the Canadian Environmental Protection Act and Canadian National Parks Act.

.2 The Contractor is held responsible to ensure that all necessary permits related to Environmental Protection have been

obtained and that necessary documentation is available on-site.

1.13 Vehicular Movements

.1 Restrict movement of vehicles and equipment to existing disturbed areas (access roads, borrow pits, disposal areas and right-of-ways).

1.14 Storage and Handling of Fuels and Dangerous Fluids

.1 Locate fuel storage facility a minimum of 100 m from any water body in an area approved by Departmental Representative and construct impermeable dykes so that any spillage is contained. Fueling of vehicles or equipment will not be permitted within 100 m of any water body. Maintenance of vehicles and equipment will be permitted only in designated areas as directed by the Departmental Representative.

.2 Exercise care in handling of fuels or dangerous materials to minimize potential for spills. Report immediately any spills to Departmental Representative. Contractor is responsible for responding immediately to any spill to minimize environmental damage and for clean-up, repair or rehabilitation resulting from any spills to the satisfaction of the Departmental Representative.

.3 Supply and maintain on site emergency response material to contain spills and minimize environmental damage, i.e. absorbent material, to the approval of Departmental Representative. Disposal of all contaminated material shall be off-site at an approved facility.

.4 Dangerous goods, whose release into the environment could cause adverse effect, should be stored and handled in a manner which gives due regard for workers and public safety, and for the protection of the environment.

.5 No material toxic to fish or any aquatic life shall be permitted to enter any stream, river, or lake. This shall include,

but not be limited to lubricants, fuels, testing fluids, insecticides, detergents, herbicides, cement, lime or concrete.

.6 The management of fuels, lubricants and chemicals must meet with the requirements of the Newfoundland & Labrador Department of Environment & Conservation and all other appropriate provincial and federal regulations.

.7 Fuel storage containers must be accompanied by impermeable structures that would provide containment of 125% of the container capacity in the event of a leak or spill.

.8 All refueling and lubricating operations should employ protection measures such as drip pans, to reduce the potential for escape of petroleum products to the environment.

.9 The Departmental Representative and the Park's Environmental Protection Officer (EPO) must be immediately contacted after a spill of fuel or lubricant, and after any amount of other chemical products has escaped.

.10 Storage of any fuel has to occur only in previously approved locations, and with Park consent. The Contractor must submit plans for fuel management and a Spill Contingency Plan seven days prior to the start of the Work. The Contractor is expected to be prepared to effect the containment and cleanup of all spills related to the Work.

.11 Storage of hazardous material, including explosives, shall not be permitted, except for quantities which shall normally be expected to be utilized in a day of Work, and which are not permitted to stockpile.

.12 Emulsion storage tanker and transfer of emulsion from tanker to spray vehicle are not permitted.

1.15 Erosion and Sediment Control

.1 Appropriate preventative controls should be in place at all times during construction to prevent undue erosion and sedimentation. The Contractor is required to provide to the Departmental Representative for approval ten (10) working days before start-up an erosion and sedimentation control plan, as part of the Environmental Protection Plan. The plan shall incorporate all necessary silt fences, silt traps, plastic lined trenches and ditches as approved by the Departmental Representative. **Hay or any other type of seed contaminant shall not be used in any type of erosion control method.**

.2 The Contractor shall install and maintain all sedimentation and erosion control features for the duration of the project, in accordance with the approved plan. The Contractor shall remove all sedimentation and erosion control upon completion of the work and when requested by the Departmental Representative.

.3 Sediment fences and erosion control structures shall be constructed in roadside ditches or at culvert inlets prior to any excavation as directed by Departmental Representative.

.4 To minimize run-off, work on slopes which may affect water body will be curtained during periods of heavy rainfall, as directed by the Departmental Representative.

.5 Prior to carrying out work, check long range weather forecast to ensure that there is adequate time before forecast of heavy rain storms to stabilize the work. Provide details of stabilization plan to Departmental Representative for review.

.6 Maintain a stockpile of appropriate erosion and environmental protection materials acceptable to the Departmental Representative (e.g. silt fences, non-woven geotextile fabric, clean rock

fill and aggregate base course) on site at all times.

.7 Install additional erosion control measures as required by site conditions to prevent sediment from entering drainage courses.

.8 Inspect erosion and sediment control measures on a daily basis and maintain as necessary.

1.16 Relics and Antiquities

.1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found on site or in structures to be demolished, shall remain property of Canada. Protect such articles and request direction from Departmental Representative.

.2 Give immediate notice to Departmental Representative if evidence of archaeological finds are encountered during construction and await his written instructions before proceeding with work in this area.

1.17 Treated Wood

.1 Workers shall be made aware of the possible health risks associated with exposure to CCA or creosote treated timber as well as the recommended safe practices for handling such materials.

.2 Disposal of treated wood wastes including saw-dust must be outside of the site, and in accordance with all applicable Provincial and Municipal regulations. Similar attention must be given to disposal of any replaced guiderail posts which have been treated with creosote, which must also be removed from the park for disposal.

1.18 Environmental Incident or Emergency

.1 In the event of an environmental incident or emergency such as:

.1 Chemical spill or petroleum spill;

.2 Poisonous or caustic gas emission;

.3 Hazardous material spill;
.4 Sewage spill;
.5 Contaminated water into waterways.
.6 The Contractor or his employees shall immediately:
.1 Notify the Contractor's job superintendent.
.2 Call the local emergency services and give type of emergency.
.3 Notify the Departmental Representative and the Park's Environmental Protection Officer (EPO).

.2 The Contractor is to submit to Departmental Representative a copy of its Environmental/Spill Response Plan for approval.

1.19 Site Decommissioning

.1 Unless prior permission from the Departmental Representative is obtained, all contractor equipment, facilities and materials must be removed from the Park at the finish of each work phase, or if work is suspended due to weather or other circumstances, upon the suspension of work activities.

.2 All work sites must be returned to a neat and tidy condition upon site abandonment.

1.20 Site Clearing

.1 Timber and vegetation shall not be cleared unless approved by Departmental Representative.

.2 Vegetation and topsoil shall not be removed to obtain fill for road construction purposes.

.3 All cleared trees and timber shall become the property of the Contractor and are to be disposed of outside the park boundaries.

.4 All cut shrub vegetation and underbrush shall be removed from the site along with the timber. No burning of any vegetation or debris will be permitted in the park boundaries.

.5 No vegetation clearing will be permitted during the annual songbird nesting period between May 1st and August 15th.

END

PART 1 - GENERAL

1.1 Refueling

.1 Refueling of equipment to be performed in locations as directed by Departmental Representative.

.2 Do not refuel equipment within 100 meters of any watercourse or storm water catch basin unless protection against spills is in place and location is approved by Departmental Representative.

.3 Use petroleum containers approved for products with no spill fill spouts for dispensing fuels. The sure pour nozzle to have self closing valve, prevent any flow of fuel until the nozzle is inserted into the receiving container. On removal from the receiving container the slide valve closes to eliminate any fuel spill. Nozzle to be equipped with its own automatic vent eliminating the need for the user to open or close air inlets on the pouring container.

.4 Nozzle to support the weight of the pouring container. Nozzles to automatically stop the flow when the receiving container becomes full. The nozzle to be such that it reduces evaporative losses of volatile organic compounds during the fuel transfer.

.5 **All spills** of hydrocarbon based products such as gasoline, kerosene, naphtha, lubricating oils, engine oils, greases and de-icing fluids or antifreeze **no matter how large or small** to be reported to Departmental Representative and the Park's Environmental Protection Officer (EPO).

.6 Oil changes or equipment repairs in the field or on Parks Canada land are not permitted.

.7 Refueling to be performed on level surfaces, PCC Portland cement concrete or HMAC surfaces when approved by the Departmental Representative unless otherwise directed.

.8 Contractor to have drip pans sized for amounts of product to be recovered and customized to fit under pieces of equipment to perform routine maintenance to equipment while maintaining equipment on property. Drip Pans to be used whenever leaving equipment on site or parking overnight when not in use.

.9 Parking of equipment on site to be on level ground in locations away from watercourses and as approved by Departmental Representative. Equipment with leaks or poor mechanical repair to be removed from site when so ordered by Departmental Representative.

1.2 Spill Control Kit

.1 Contractor to have at the work site a spill control kit consisting of the following minimum types of equipment:

.1 a spaded shovel;
.2 a stable broom;
.3 a broad nosed shovel;
.4 a container(s) suitable, compatible to and of sufficient size to contain petroleum products being used with equipment;
.5 Absorbents;
.6 rags;
.7 metal container for soiled rags;
.8 Booms when working next to a watercourse that will traverse the width of the watercourse by two times; and
.9 Spill control kit to be inspected and approved by both the Newfoundland and Labrador Department of Environment & Conservation and the Departmental Representative prior to Work commencing. Spill control kits to be available to Contractor employees at all areas where Work of the Contract is being performed and at all times during the course of the Contract.
.10 Contractor employees to be trained in the use of the spill control kit and the equipment they contain.

1.3 Spills

.1 Disposal of spilled materials to be off Parks Canada property and at approved locations for materials to be disposed of.

.2 When parking of equipment on site, the equipment is to be secured from entry, inspected for leaks and the ground protected from leaks.

.3 Contractor to protect all wells, catch basins, drywells, drains and watercourses from contamination in event of a spill.

.4 All equipment to be used for the Work of the Contract to be inspected by the Departmental Representative for leaks. Equipment not in good repair to be removed/repaired when directed by Departmental Representative.

.5 Spills to be reported immediately to Departmental Representative, the Park’s Environmental Protection Officer (EPO) and the Newfoundland and Labrador Department of Environment and Conservation.

.6 Contractor to immediately remove as much or all of the contaminated soils as possible, from any spills created from Work of the Contractor.

.7 Contaminated soils/materials to be placed in containers compatible to the contaminants.

.8 Any remaining clean-up to be performed at no extra cost to Parks Canada. Clean-up to be to the Departmental Representative's satisfaction.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

1.2 Inspection

.1 Give minimum 24 hours notice requesting inspection of Work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.

.2 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

.3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed.

.4 Pay costs to uncover and make good work disturbed by inspections and tests.

1.3 Testing

.1 Tests on materials, as specified in various sections of the Specifications are the responsibility of the Department except where stipulated otherwise.

.2 Departmental Representative will engage and pay for service of Independent Inspection and Testing Agencies for purpose of inspecting and testing portions of Work except for the following which remain part of Contractor's responsibilities:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's

convenience.

.3 Mill tests and certificates of compliance.

.4 Tests as specified within various sections designated to be carried out by Contractor under the supervision of Departmental Representative.

.5 Additional tests specified in Clause 1.3.2.

1.5 Access to Work

.1 Facilitate Departmental Representative's access to Work. If part of Work is being fabricated at locations other than construction site, make preparations to allow access to such Work whenever it is in progress.

.2 Furnish labour and facility to provide access to the work being inspected and tested.

.3 Co-operate to facilitate such inspections and tests.

1.6 Rejected Work

.1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.

.2 Make good damages to new construction and finishes resulting from removal or replacement of defective work.

END

PART 1 - GENERAL

1.1 Section Includes

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.2 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 Related Sections

.1 Section 01 56 00 - Temporary Barriers and Enclosures.

1.4 References

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1-GP-189M-84, Primer, Alkyd, Wood, Exterior.
- .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)
- .1 CAN3-A23.1-/A23.2-94, Concrete Materials and Methods for Concrete Construction/Method of Test for Concrete.
- .2 CSA-0121-M1978, Douglas Fir Plywood.
- .3 CAN/CSA-Z321-96, Signs and Symbols for the Occupational Environment.

1.5 Installation and Removal

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.6 Scaffolding

.1 Provide and maintain scaffolding, ladders and temporary stairs.

1.7 Hoisting

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists cranes shall be operated by qualified operator.

1.8 Site Storage/Loading

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.9 Construction Parking

.1 Parking will be limited to Contractor vehicles and equipment required to carry out work only, provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Build and maintain temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work.

.4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.10 Security

.1 Contractor shall provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays (24 hours per day, seven (7) days per week).

1.11 Equipment, Tool and Materials Storage

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.12 Sanitary Facilities

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.13 Construction Signage

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.2 Signs and notices for safety and instruction shall be in both official languages Graphic symbols shall conform to CAN3-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

END

PART 1 - GENERAL

1.1 Description

.1 This section is to provide traffic control as stipulated in the Department of Transportation and Works Traffic Control Manual (TCM).

.2 A Traffic Control Plan must be approved by the Departmental Representative prior to commencing any work. Traffic Control Plan to be submitted prior to the pre-construction meeting.

1.2 Related Sections

.1 Section 01 11 10 - General Instructions.

.2 Section 01 35 29 - Health and Safety Requirements.

.3 Section 01 56 00 - Temporary Barriers and Enclosures.

1.3 Reference Standard

.1 Government of Newfoundland and Labrador Department of Transportation and works, Highway Design Division.

.1 Traffic Control Manual (TCM), latest edition.

1.4 Protection of Public Traffic

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to present minimum of interference and hazard to travelling public.

.2 Keep equipment units as close together as working conditions will permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Do not close any lanes of roadway without approval of Departmental Representative.

The Contractor must formally request a road closure with the Departmental Representative if they feel it is necessary. Before re-routing traffic, erect suitable signs and devices in accordance with instructions contained in the TCM. Provide sufficient crushed gravel to ensure a smooth riding surface during work.

.4 Roads that cannot be closed include:
- .1 Main Access Road off of TCH.
- .2 Emergency Exit.
- .3 Access Road to Treatment Plant/Pumphouse in MH.
- .4 Any campground roads in Newman Sound west of the scope of work.

.5 Keep travelled way well graded, free of potholes and of sufficient width that required number of lanes of traffic may pass.

.6 Maintain dust control as needed with calcium and water.

.7 When directed by Departmental Representative, provide well graded, detours or temporary roads to facilitate passage of traffic around restricted construction area. Provide and maintain signs and lights and maintain roadway.

.8 Provide and maintain reasonable road access and egress to property fronting along or in vicinity of work under Contract unless approved otherwise by Departmental Representative.

.9 All flag persons and traffic control personnel shall have successfully completed a traffic control training course approved by the Workplace Health, Safety and Compensation Commission of Newfoundland and Labrador. Proof of training for all persons shall be available on site at all times.

1.5 Informational and Warning Devices

.1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.

.2 All traffic signs are to be bilingual or symbolic and shall be Level 1 reflectivity.

.3 Supply and erect signs, declinators, barricades and miscellaneous warning devices as specified in TCM.

.4 Place signs and other devices in locations recommended in the TCM.

.5 A Traffic Control Plan must be approved by the Departmental Representative prior to commencing any work.

.6 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Removing or covering signs which do not apply to conditions existing from day to day.

1.6 Control of Public Traffic

.1 Provide traffic control personnel at each entrance to Terra Nova National Park Newman Sound Campground and Malady Head Campground who have valid provincial certification and are trained in accordance with and properly equipped as specified in the TCM, in following situations:

.1 When public traffic is required to pass working vehicles or equipment which may block all or part of travelled roadway.

.2 When it is necessary to institute one way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workers or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.2 All Traffic Control Personnel shall be equipped with portable radios of sufficient range to ensure continuous communication within the traffic control zone.

.3 All construction vehicles shall operate in accordance with and are subject to traffic control restrictions and operations in place on the project.

.4 In addition to traffic control during the normal hours of work, the contractor shall have a responsible person on site at all times to monitor that the traffic signage is working properly (including nights, weekends and holidays).

.5 Flag persons are to be equipped with portable radios only, not cellular devices. Any flag person using cellular devices, except for emergency use only, shall be deemed incompetent and shall be removed from site immediately. PCA shall not be held responsible for lost time incurred due to the removal of such an individual.

1.8 Operational Requirements

.1 Maintain existing conditions for traffic crossing right-of-way containing work except that, when required for construction under this Contract and when measures have been taken as specified herein and approved by

Departmental Representative, to protect and control public traffic.

END

PART 1 - GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Related Sections

.1 Section 01 52 00 - Construction Facilities.

.2 Section 01 55 26 – Traffic Regulation.

1.3 References

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1.189M-84, Primer, Alkyd, Wood, Exterior.
- .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)
- .1 CSA-O121-M1978, Douglas Fir Plywood.

.3 Government of Newfoundland and Labrador, Department of Transportation and works, Highway Design Division.
- .1 Traffic Control Manual (TCM), latest edition.

1.4 Installation and Removal

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.5 Guard Rails and Barricades

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

.3 Provide Traffic Control guard rails, barricades and delineators in accordance with Section 01 55 26 – Traffic Regulation.

1.6 Access to Site	.1	Provide and maintain access roads, as may be required for access to Work.
1.7 Public Traffic Flow	.1	Provide Traffic Control in accordance with Section 01 55 26 – Traffic Regulation.
1.8 Fire Routes	.1	Maintain access to properties for use by emergency response vehicles.
1.9 Protection for Off-Site and Public Property	.1	Protect surrounding private and public property from damage during performance of Work.
	.2	Be responsible for damage incurred.

END

PART 1 - GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Reference Standards

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.3 Quality

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against

oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 Availability

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 Storage, Handling and Protection

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's

instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber, fencing on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 Transportation

.1 Pay costs of transportation of products required in performance of Work.

1.7 Manufacturer’s Instructions

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from

manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 Quality of Work

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.9 Co-Ordination

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 Remedial Work

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as

required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 Existing Utilities

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 78 00 - Closeout Submittals.

1.2 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 References

.1 Parks Canada's identification of existing survey control points and property limits. Departmental Representative is responsible for surveys and layout of work.

1.4 Survey Reference Points

.1 Contractor is to locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.2 Make no changes or relocations without prior written notice to Departmental Representative.

.3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.4 The Contractor is responsible to hire surveyor to replace control points in accordance with original survey control, if disturbed unnecessarily during construction activities.

1.5 Survey Requirements

Departmental Representative will:

.1 Establish permanent bench marks on site, as required, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement.

.4 Stake slopes.

.5 Establish pipe invert elevations and location of any exposed pipe not being removed under this contract.

.6 Record elevation and location of all existing and installed end caps of abandoned underground services.

.7 Provide coordinates, elevations and dimensions in the field, as required by the Departmental Representative.

1.6 Existing Services

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

1.7 Records

Departmental Representative will:

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of site works, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

END

PART 1 - GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Related Section

.1 Section 01 77 00 - Closeout Procedures.

1.3 Project Cleanliness

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Parks Canada or other Contractors.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use clearly marked separate bins for recycling.

.6 Remove waste material and debris from site and deposit in waste container at end of each working day.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Dispose of waste materials, and debris off site at approved facilities.

.9 All waste materials removed from site become the sole property/responsiblity of the Contractor.

1.4 Final Cleaning

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.7 Remove dirt and other disfiguration from exterior surfaces.

.8 Sweep and wash clean paved areas.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

1.2 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 Definitions

.1 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.2 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.3 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.4 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.5 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.6 Salvage: Removal of structural and non-structural materials from

deconstruction/disassembly projects for purpose of reuse or recycling.

.7 Separate Condition: Refers to waste sorted into individual types.

.8 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.4 Documents

.1 Maintain at job site, one copy of following documents:
.1 Material Source Separation Plan.

1.5 Submittals

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit following prior to project start-up:
.1 Submit two (2) copies of Materials Source Separation Program (MSSP) description.

1.6 Waste Reduction Workplan (WRW)

.1 Prepare, Waste Reduction Workplan.

.2 Structure WRW to prioritize actions and follow as first priority Reuse, then followed by Recycle.

.3 Describe management of waste.

.4 Post workplan or summary where workers at site are able to review its content.

1.7 Materials Source Separation Program (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up. The Demolition Waste Audit (DWA), with related weight bills and/or receipt must be submitted on a monthly basis with the Contractor's monthly Progress claim.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental

Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separated condition.

.1 Transport to approved and authorized recycling facility.

1.8 Storage, Handling and Protection

.1 Store, materials to be reused, recycled and salvaged in locations as specified in MSSP.

.2 Unless specified otherwise, materials for disposal, storage/stockpiling, reuse and recycling leaving the Park site boundaries shall become the property of the Contractor. The Contractor shall obtain permits from authorities having jurisdiction for disposal and recycling of all materials removed from the Park site boundaries.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
- .1 On-site source separation is recommended.
- .2 Remove co-mingled materials to off-site processing facility for separation.
- .3 Provide waybills for separated materials.

1.9 Disposal of Wastes

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil or paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:
- .1 Number and size of bins.
- .2 Waste type of each bin.
- .3 Total tonnage generated.
- .4 Tonnage reused or recycled.
- .5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.10 Use of Site and Facilities

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by PCA.

1.11 Scheduling

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 - PRODUCTS

.1 (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Application

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 Cleaning

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END

PART 1 – GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Related Sections

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 01 74 11 - Cleaning.

1.3 Inspection and Declaration

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

- .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Work has been completed and in compliance with Workplace Health, Safety and Compliance Commission of Newfoundland and Labrador (WHSCC).
- .4 Operation of systems have been demonstrated to Departmental Representative's personnel.
- .5 Work is complete and ready for Final Inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, in conjunction with Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

END

PART 1 - GENERAL

1.1 Precedence

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 – Testing and Quality Control.

.3 Section 01 71 00 - Examination and Preparation.

.4 Section 01 77 00 - Closeout Procedures.

1.3 Submission

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products and submit to Departmental Representative.

.2 A copy of this document will be returned after final inspection, with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of shop drawing and materials testing manuals in English.

.5 If requested, furnish evidence as to type, source and quality of products provided.

.6 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.7 Pay costs of transportation/delivery.

1.4 Format

.1 Binders: vinyl, hard covered, three (3) 'D' ring, loose leaf 219 x 279 mm with spine

and face pockets.

.2 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.3 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.4 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.5 Text: Manufacturer's printed data, or typewritten data.

.6 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.7 Provide 1:1 scaled CAD files in dxf or dwg format on USB storage device or CD.

1.5 Contents - Each Volume

.1 Table of Contents: provide title of project;
- .1 date of submission; names,
- .2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;
- .3 schedule of products and systems, indexed to content of volume.

.2 For each product or system:
- .1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts

of systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Testing and Quality Control.

1.6 As-Builts and Samples

.1 Maintain at the site for Departmental Representative one record copy of:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Change Orders and other modifications to the Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.7 Recording Actual Site Conditions

.1 Record information on set of drawings, provided by Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colors for each major system, for

recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
- .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- .2 Field changes of dimension and detail.
- .3 Changes made by change orders.
- .4 Details not on original Contract Drawings.
- .5 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:
- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.8 Final Survey

.1 Contractor is to submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 Warranties and Bonds

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and

manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 01 74 21 – Construction /Demolition Waste Management Disposal

.2 Section 33 05 16 – Manhole and Catch Basin Structures

.3 Section 33 11 13 – Site Water Utility Distribution Piping

.4 Section 33 31 13 – Public Sanitary Utility Sewerage Piping

1.2 Related Requirements

.1 Refer to detailed drawings for specific requirements for removals.

1.3 References

.1 Reference Standards:
- .1 Canadian Council of Ministers of the Environment (CCME)
  - .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.4 Site Conditions

.1 Site Environmental Requirements.
- .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
- 2 Ensure that removals work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or

toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.6 Protect trees, plants and foliage on site and adjacent properties where indicated.

.2 Existing Conditions.

.1 Remove contaminated or hazardous materials from site as directed by Department Representative, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with applicable regulatory requirements.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Preparation

.1 Inspect site with Department Representative and verify extent and location of items designated for removal, disposal, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Contact proper utility companies in order to coordinate the demolition of the building.

3.2 Removal of Hazardous Waste

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner in accordance with applicable regulations, to minimize danger at site or during disposal.

3.3 Removal Operations

.1 Remove items as indicated in their corresponding Sections.

.2 Do not disturb items designated to remain in place.

.3 Removal/abandonment of manholes: to Section 33 05 16.

.4 Electrical decommissioning: as indicated on Drawings. Electrical decommissioning shall be completed by a Registered Electrician.

.5 Removal/abandonment of pipes:
- .1 Remove sections of piping as indicated.
- .2 Piping to be abandoned shall be capped.
- .3 Caps shall also be provided where required to block off and seal ends of pipes that are being abandoned or otherwise isolated, incidental to the work.

.6 Removal/abandonment of septic tanks and distribution boxes:
- .1 Abandon/remove in accordance with Provincial and Federal Guidelines and as indicated on the Drawings.
- .2 Pump out contents and dispose of at an approved receiving facility.
- .3 Remove tanks, distribution boxes, and covers where indicated.
- .4 Tanks and distribution boxes to be abandoned in place shall be filled with approved granular material and compacted in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.

.7 Decommissioning of septic pits:
- .1 Abandon/remove in accordance with Provincial and Federal Guidelines and as indicated on the Drawings.
- .2 Pump out liquid / semi-liquid contents and dispose of at an approved receiving facility.
- .3 Pits to be abandoned in place shall be filled with approved granular material and compacted in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.

.8 Decommissioning of septic fields:
- .1 Septic fields to be abandoned in place in accordance with Provincial and Federal Guidelines unless indicated otherwise on the Drawings.
- .2 Where new septic field is to be constructed in same location as existing, existing septic field materials including granular material, pipes, etc., shall be removed to the depth indicated on the Drawings, and disposed of at an appropriate facility.

.9 Once the items have been removed, the site is to be properly shaped and graded to match existing ground.

.10 Disposal of Material:
- .1 Dispose of materials not designated for salvage or reuse on site.

.11 Backfill:
- .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.12 Waste materials removed from site become the property and responsibility of the Contractor.

3.4 Restoration

.1 Restore areas and existing works outside areas of demolition match condition of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.5 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6 Protection

.1 Repair damage to adjacent materials or property caused by selective site demolition.

END

PART 1 - GENERAL

1.1 Summary

.1 Comply with requirements of this Section when performing the following work:

.1 Removing non-friable asbestos-containing materials if the material is being removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

.2 Break, cut, grind, sand, drill, scrape, vibrate or abrade non-friable asbestos containing materials using non-powered hand-held tools, and the material is wetted to control the spread of dust or fibres.

1.2 Related Sections

.1 Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Section 33 11 16 – Site Water Utility Distribution Piping

1.3 References

.1 Department of Justice (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Transport Canada

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.4 Definitions

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.4 Authorized Visitors: Engineer[s], Consultant[s] or Departmental Representative[s], and representative[s] of regulatory agencies.

.5 Competent worker: in relation to specific work, means a worker who:
- .1 Is qualified because of knowledge, training and experience to perform the work.
- .2 Is familiar with the federal / provincial laws and with the provisions of the regulations that apply to the work.
- .3 Has knowledge of all potential or actual danger to health or safety in the work.

.6 Friable material: means material that:
- .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or
- .2 is crumbled, pulverized or powdered.

.7 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.8 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.5 Action and Information Submittals

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Departmental Representative necessary permits for transportation and disposal of

asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.6 Quality Assurance

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the

worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres.Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before

removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.5 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.6 Ensure workers wash hands and face when leaving Asbestos Work Area.

.7 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.7 Waste Management and Disposal

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.4 Fold up metal banding, flatten and place in designated area for recycling.

.5 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness [6] mils bags or leak proof drums. Label containers with appropriate warning labels.

.6 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 Existing Conditions

.1 The existing raw water transmission main is made of asbestos cement fibres. This main will be crossed as shown on the drawings and will also be located regularly as per Section 33 11 16 - Site Water Utility Distribution Piping. Notify

Departmental Representative of any requirement to cut or break the existing asbestos cement water line. This work is not to proceed until Departmental Representative had verified that all required personal protection is in place.

1.9 Personnel Training

.1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, following minimum requirements:
- .1 Fitting of equipment.
- .2 Inspection and maintenance of equipment.
- .3 Disinfecting of equipment.
- .4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person.

PART 2 - PRODUCTS

2.1 Materials

.1 Wetting Agent: water to be used while cutting or breaking the existing asbestos cement water main to minimize the spread of ACM's.

.2 Waste Containers: contain waste in two separate containers.
- .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
- .3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.

.3 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.4 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

PART 3 - EXECUTION

3.1 Procedures

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Before beginning Work, inform all other non-essential personnel to exit the surrounding area or remain in a sealed environment (inside construction equipment) and ensure air is on recirculation mode and not drawing from the outside if equipment is located within 30m of the Asbestos work area.

.3 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
   .1 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
   .2 Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.5 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.
   .1 Use garden reservoir type low - velocity fine - mist sprayer.
   .2 Perform Work to reduce dust creation to lowest levels practicable.
   .3 Work will be subject to visual inspection and air monitoring.
   .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require clean-up of affected areas.

.6 Cleanup:
   .1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.
   .2 Clean exterior of each waste-filled bag using

damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 20 00 - Concrete Reinforcing.

.2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 References

.1 Canadian Standards Association (CSA)
.1 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
.2 CAN/CSA-O86-01 (R2006), Engineering Design in Wood (Limit States Design).
.3 CSA O121-M1978 (R2003), Douglas Fir Plywood.
.4 CSA O151-04, Canadian Softwood Plywood.
.5 CSA O153-M1980 (R2003), Poplar Plywood.
.6 CAN3-O188.0-M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
.7 CSA O437 Series-93 (R2001), Standards for OSB and Waferboard.
.8 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
.9 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork.

1.3 Shop Drawings

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings Comply with CAN/CSA-S269.3 for formwork drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

PART 2 - PRODUCTS

2.1 Materials

.1 Formwork materials:
  .1 Use formwork materials to CAN/CSA-A23.1.

.2 Form ties:
  .1 Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.3 Form release agent: non-toxic, chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing set of film of concrete in contact with form.

.4 Falsework materials: to CSA-S269.1.
  .1 Materials required to bear grade marks, or be accompanied with certificates, test reports or other proof of conformity.

.5 Pre-moulded joint fillers:
  .1 Bituminous impregnated fibreboard to ASTM D1751.

.6 Bond Breaker:
  .1 Impermeable tube formed of polyvinylchloride, rubber or similar material to the approval of the

Departmental Representative. Internal diameter equal to dowels.

PART 3 - EXECUTION

3.1 Fabrication and Erection

.1 Verify lines, levels and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.6 Align form joints and make watertight. Keep form joints to minimum.

.7 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.10 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 Removal and Reshoring

.1 Leave formwork in place for following minimum periods of time after placing concrete.
   .1 [7] days for walls and sides of beams.
   .2 [7] days for columns.
   .3 [5] days for beam soffits, slabs, decks and other structural members, or [3] days when replaced immediately with adequate shoring to standard specified for falsework.
   .4 [5] days for footings and abutments.

.2 Remove formwork when concrete has reached [75]% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 References

.1 American Concrete Institute (ACI)
.1 ACI 315R-80, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
.1 ANSI/ACI 315-80, Details and Detailing of Concrete Reinforcement.

.3 Canadian Standards Association (CSA)
.1 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
.2 CSA-A23.3-04, Design of Concrete Structures for Buildings.
.3 CSA G30.3-M1983(R1998), Cold Drawn Steel Wire for Concrete Reinforcement.
.4 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
.5 CSA G30.14-M1983(R1998), Deformed Steel Wire for Concrete Reinforcement.
.6 CSA G30.15-M1983(R1991), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
.7 CAN/CSA-G30.18-M92(R2007), Billet-Steel Bars for Concrete Reinforcement.
.8 CAN/CSA-G40.21-04, Structural Quality Steels.
.9 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.10 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 Shop Drawings

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada. ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

1.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and the Waste Reduction Workplan.

PART 2 - PRODUCTS

2.1 Materials

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.

.4 Cold-drawn annealed steel wire ties: to CSA G30.3.

.5 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.

.6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.7 Mechanical splices: subject to approval of Departmental Representative.

.8 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.

2.2 Fabrication

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures unless indicated otherwise.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

.1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to commencing reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

3.1 Field Bending

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 Placing Reinforcement

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1/A23.2.

.2 Install, support and space reinforcement in alignment to position and clearances indicated and secure to supports.

.3 Unless otherwise indicated, provide the following cover for reinforcing:

75 mm - Where concrete is cast against earth.
50 mm - 20M bars or larger.
50 mm - Slabs-on-grade.
40 mm - 15M bars or smaller.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Prior to placing concrete, obtain Engineer's approval, in writing, of reinforcing material and placement. Use of approved chairs to support reinforcement in slabs is mandatory.

.6 Remove and replace reinforcement which is visibly damaged or cracked.

.7 Do not cut reinforcement, either before or after concrete is placed, to permit incorporation of other work.

.8 Do not relocate reinforcement without approval.

.9 Clean reinforcement before placing concrete.

.10 All wall dowels shall be set in footing forms prior to placing concrete and held in place by approved means so that each dowel is maintained in its correct position. Dowels shall not be inserted in freshly placed concrete.

.11 The Engineer shall be notified when the reinforcing steel is in place and in sufficient time to permit an inspection of same prior to concrete placement. Minimum 24-hour notification required.

3.3 Cleaning

.1 Clean reinforcing before placing concrete to CAN/CSA-A23.1.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

1.2 References

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C109/C109M-05, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
- .2 ASTM C260-06, Specification for Air-Entraining Admixtures for Concrete.
- .3 ASTM C494/C494M-05a, Specification for Chemical Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.2-04, Methods of Test for Concrete.
- .3 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
- .4 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005.
  - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

1.3 Design Requirements

.1 Alternative 1 - Performance: in accordance with CSA A23.1/A23.2, and as described in MIXES of PART 2 – PRODUCTS.

1.4 Submittals

.1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.

.2 Minimum two (2) weeks prior to starting

concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.
.2 Blended hydraulic cement.
.3 Supplementary cementing materials.
.4 Grout.
.5 Admixtures.
.6 Aggregates.
.7 Water.

.3 Minimum two (2) weeks before starting the concrete work, submit design mix for particular concrete to the Departmental Representative for review and approval.

.4 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.

.5 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

.6 Minimum two (2) weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative’s approval for following items:

.1 Cold and hot weather concreting.
.2 Temporary bracing.
.3 Chairs and spacers for support of reinforcing.
.4 Curing of concrete.
.5 Finishes.
.6 Formwork removal.

1.5 Storage of Materials

.1 Store materials to prevent contamination or deterioration.

.2 Provide adequate storage facilities for materials to ensure a continuous supply of these materials during batching

operations.

.3 Store cement in weathertight facility.

1.6 Quality Control

.1 Inspection and testing of concrete and concrete materials will be carried out in accordance with CSA A23.1.

.2 Testing laboratory will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.3 Non-destructive methods for testing concrete shall be in accordance with CSA A23.2.

.4 Inspection or testing by Departmental Representative, or Testing Agency designated by Departmental Representative, will not augment or replace the Contractor's quality control nor relieve him of his contractual responsibilities.

1.7 Delivery Storage and Handling

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to Departmental Representative laboratory representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling.

.2 Divert unused concrete materials from landfill to local quarry facility approved by Departmental Representative.

.3 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous

material collections site as approved by the Departmental Representative.

.5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

1.8 Waste Management and Disposal

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate a cleaning area for tools to limit water use and runoff.

.3 Carefully coordinate the specified concrete work with weather conditions.

.4 Ensure emptied containers are sealed and stored safely for disposal away from children.

.5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.6 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2 - PRODUCTS

2.1 Materials

.1 Cement to CAN/CSA-A3001, Type GUb.

.2 Supplementary cementing materials: to CAN/CSA-A3001.

.3 Cementitious hydraulic slag: to CAN/CSA-A3001.

.4 Water: to CAN/CSA-A23.1.

.5 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
.1 Maximum aggregate size in footings shall be 38 mm. In walls, the maximum aggregate size shall not exceed 19 mm

.6 Air entraining admixture: to ASTM C260.

.7 Chemical admixtures: to ASTM C494/C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.8 Concrete retarders: to ASTM C494/C494M. Do not allow moisture of any kind to come in contact with the retarder film.

.9 Shrinkage compensating grout: premixed compound consisting of non metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2 .
.1 Acceptable products:
.1 M-Bed standard by Sika Canada Inc.
.2 Masterflow 713 Grout by BASF Canada Inc.
.3 NS Grout by Euclid Canada Inc.
.4 Alternate materials: Approved by addendum in accordance with Instructions to Tenderers.

.10 Acrylic adhesive for dowel and anchor rod anchorage: to ASTM C881, Type IV, Grade 3, Class A, B and C.
.1 Acceptable products:
.1 Sika AnchorFix-1 Anchoring Adhesive by Sika Canada.
.2 EPCON A7+ Adhesive Anchoring System by ITW Red Head.
.3 HIT-HY 200 Adhesive Anchoring System by Hilti Canada.

.4 AT-XP Anchoring Adhesive by Simpson Strong-tie.
.5 Alternate materials: Approved by addendum.

.11 Curing compound:
.1 To CSA A23.1/A23.2 white and ASTM C309,
.2 To be white pigmented. Subject to compatibility with specified finishes, removal may be required.
.3 Acceptable products:
.1 Kurez Vox by Euclid Chemical Company.
.2 1220-WHITE Pigmented Curing Compound by W.R. Meadows.
.3 Florseal by Sika Canada.
.4 Alternate materials: Approved by addendum in accordance with Instructions to Tenderers.
.5 Use curing compounds compatible with applied finish on concrete surfaces. Provide written certification that compounds used are compatible.

.12 Premoulded joint fillers (Isolation Joints):
.1 Isolation Joint Filler: Closed cell foam expansion joint material. To be chemical resistant, ultraviolet stable, non-absorbent, low density.
.2 To be supplied with removable strip to provide a uniform sealing reservoir in the joint.
.3 Recovery to be 97% minimum to ASTM D545. Compressive strength to be 10 psi minimum to 25 psi maximum to ASTM D1752, Section 5.1 – 5.4. Water absorption to be less than 0.25% by volume to ASTM D3575.
.4 Acceptable Products: Deck-O-Foam by W.R. Meadows Ltd., or approved alternate.

.13 Dampproof membrane:
.1 Polyethylene underslab vapour barrier, 0.25 mm (10 mil), meeting minimum requirements of ASTM E1745 Class C. Supply with bond tape for joints.
.2 Acceptable Products:
.1 VaporBlock VB10 by Raven

Industries.

.2 Moistop Ultra 10 by Fortifiber.

.3 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.

.14 Dampproofing:

.1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB 37.2, and to Section 07 11 13 Bituminous Dampproofing.

.16 Foundation Insulation:

.1 Extruded Polystyrene to CAN/CGSB-51.20, Styrofoam SM, by Dow Corning, or approved alternate, thickness as indicated.

2.2 Mixes

.1 The Contractor shall be responsible for the concrete mix design and shall submit to the Departmental Representative for approval at a minimum of two [2] weeks before pouring concrete.

.2 It shall be the responsibility of the Contractor to ensure that the mixture proportions shall be properly batched, mixed, placed and cured such that the concrete conforms to the specifications.

.3 Proportion normal density concrete in accordance with CSA A23.1, Alternative 1, to give the following quality for concrete as indicated:

.1 For concrete in foundation walls and footings:

.1 Type GU cement.

.2 Minimum compressive strength at 28 days: 30 MPa.

.3 Class of exposure: F-2.

.4 Maximum water/cement ratio: 0.45.

.5 Nominal maximum size of coarse aggregate: 20 mm.

.6 Slump at time and point of discharge: 80 mm ± 30 mm.

.7 Air content: 5 to 8%. (Not applicable to footings.)

.2 For concrete in interior slab-on-grade:

.1 Type GU cement.

.2 Minimum compressive strength at 28 days: 30 MPa.

.3 Class of exposure: N.

.4 Maximum water/cement ratio: 0.45.

.5 Nominal maximum size of coarse aggregate: 20 mm.

.6 Slump at time and point of discharge: 80 mm ± 30 mm.

.3 For exterior concrete including slabs, pads and bases:

.1 Type GU cement.

.2 Minimum compressive strength at 28 days: 35 MPa

.3 Class of exposure: C-1

.4 Maximum water/cement ratio: 0.40.

.5 Nominal maximum size of coarse aggregate: 20 mm.

.6 Slump at time and point of discharge: 80 mm ± 30 mm.

.7 Air content: 5 to 8%.

.4 For concrete used in mud-slabs:

.1 Type GU cement.

.2 Compressive strength at 28 days: 15 MPa.

.3 Slump: 75 mm.

.4 Nominal size of coarse aggregate: 20 mm.

PART 3 - EXECUTION

3.1 Preparation

.1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours' notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance

with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:
.1 Development of cold joints not allowed.
.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.8 Do not place load upon new concrete until authorized by Departmental Representative.

.9 Reinforcing steel, embedded parts, and inserts to be secured in position prior to placing concrete.

3.2 Construction

.1 Minimum concrete cover over reinforcing steel bars to be 75 mm.

.2 Do cast in place concrete work in accordance with CSA A23.1/A23.2.

.3 Hot-weather and cold-weather concreting shall be carried out, protected, and cured in accordance with CSA A23.1.

.4 Ensure reinforcement and inserts are not disturbed during concrete placement.

.5 Cure all concrete for a minimum of 7 days after placing.

.6 Keep concrete surfaces moist continually during protection stage.

.7 Place, consolidate, finish, cure and protect concrete to CAN/CSA-A23.1.

.8 Do not commence placing concrete until Departmental Representative has inspected and approved forms, foundations, reinforcing steel, joints, conveying, spreading, consolidation and finishing equipment and curing and protective methods.

3.3 Formwork

.1 Install and strip formwork to CAN/CSA-A23.1 and Section 03 10 00 - Concrete Forming and Accessories.

3.4 Inserts

.1 Position and secure anchor bolts in formwork to maintain line and grades.

.2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.

3.5 Control Joints

.1 Construct control joints in locations shown on drawings or directed by Departmental Representative.

.2 All joints will be centered over a support. Joints will be made in a perfectly straight line.

.3 Cut control joint when concrete has hardened.

.4 Fill saw cut with joint sealer as specified.

3.6 Construction Joints

.1 No horizontal construction joints will be permitted in any foundation walls unless noted on the drawings or otherwise approved by the Departmental

Representative.

.2 Any construction joints not indicated on the drawings to be approved by the Departmental Representative.

.3 Unless noted otherwise, construction joints detailed without a key shall have a roughened surface and reinforcing steel shall be continuous through construction joints

3.6 Placing Concrete

.1 Place and consolidate concrete to CAN/CSA-A23.1.

.2 Do not place concrete on or against frozen material.

.3 Place concrete continuously from joint to joint.

.4 Place concrete in a uniform heading, normal to the centerline. Limit rate of placing to that which can be finished before beginning of initial set.

3.7 Strike Off and Consolidation

.1 High speed internal poker vibrators shall be used to consolidate the concrete during placing. Final compaction of the surfaces shall be done by beam-type vibratory air screed as approved by Departmental Representative. A surcharge of approximately 65 mm of concrete will be maintained at the screed face during consolidation.

.2 Strikeoff and consolidation must be completed before excess water bleeds to the surface.

.3 Ensure that the concrete deck conforms to the elevations and slopes as shown on the drawings so that satisfactory drainage will result.

3.8 Finishing

.1 Only ACI certified or other pre-approved concrete finishers are to be utilized in finishing all concrete works. All work is to be finished to CAN/CSA-A23.1, and as specified below.

.2 The surface will be brought to the specified level by means of darbying or bull floating which will be carried out immediately following screeding and must be completed before any bleed water is present on the surface. Surface tolerance to be 8 mm under a 3 meter straight edge.

.3 Finish slabs to elevations indicated on drawings.

.4 Strike off the surface with a straight edge.

.5 Hand tamp low slump concrete with jitterbug.

.6 Darby or bull float the surface to smooth and level the concrete.

.7 Allow bleed water or sheen to disappear.

.8 Float the surface by means of power and/or hand float where the concrete has hardened enough for a man to leave only slight footprints on the surface.

.9 Do not bring water and fines to the surface by over floating. Where extra floating is required the floating operation shall be repeated after the time interval necessary for any sheen to disappear and for concrete to set further.

.10 Steel trowel the concrete surfaces by means of power and/or hand trowel. Do not leave any hard, smooth, polished or burnished surface area.

.11 Do not bring water and fines to the surface by over troweling.

.12 Lightly broom surface with a soft bristle broom obtaining a fine and even textured finish with a non-slip finish. All brush strokes to be parallel across paving.

.13 The surface shall be true and accurate to a maximum tolerance of 1 mm in 500 mm.

3.9 Protection and Curing

.1 Cure to CAN/CSA-A23.1.

.2 Cure concrete by protecting it against loss of moisture, rapid temperature changes and mechanical injury for at least seven (7) days after placement. After finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by whatever curing medium is applicable to local conditions and approved by the Departmental Representative. The edges of concrete slabs exposed by removal of forms shall be protected with continuous curing treatment equal to the method selected for curing the slab and curb surfaces. Cure to CAN/CSA-A23.1. Have the equipment needed for adequate curing at hand and ready to install before actual concrete placement begins.

.3 When air temperature is at or below 5°C or when there is a probability of its falling to that limit within 24 hours of placing (as forecast by the nearest official meteorological office) cold weather protection as per CAN/CSA-A23.1 will be provided and the following:

.1 Housing - Protect concrete by a windproof shelter of canvas or other material to allow free circulation of inside air around fresh touch formwork and provide sufficient space for removal of formwork for finishing. Supply approved heating equipment capable of keeping inside air at a constant temperature sufficiently high to maintain concrete at following curing temperatures.

.1 For initial three (3) days at a temperature of not less than 15°C nor more than 27°C at surface.

.2 Maintain concrete at 10°C for an extra four (4) days plus the initial three (3) days.

.3 In addition to the protective housing, the concrete must be

cured as outlined in Clause 3.9.2 above.

3.10 Testing

.1 Department Representative shall test all work under this section of specification as per CAN/CSA-A23.1.

.2 Cost of compressive strength tests shall be paid for by the Departmental Representative.

.3 Testing company shall issue reports to Departmental Representative on quality of test cylinders.

.4 Notify Departmental Representative at least seven (7) days prior to start of placing concrete. Provide for testing purposes an adequate quantity of approved test cylinders.

.5 At least one (1) set of three (3) cylinders each shall be taken from 25 m^3 or fraction thereof of each day's pour, whichever is less. One (1) cylinder shall be tested at seven (7) days and other two (2) tested at 28 days.

.6 Crate cylinders and deliver to the testing laboratory within 48 hours after casting in accordance with CAN/CSA-A23.1. Contractor will pay for crating and delivery of cylinders to the laboratory.

.7 If strength tests of test cylinder for any portion of the work falls below the specified compressive strength at 28 days, the Departmental Representative reserves the right to determine the acceptability of the concrete by performing additional field testing as outlined in CAN/CSA-A23.1.

.8 If concrete does not conform to drawings or specifications, take measures as directed to correct the deficiency. All costs of correctional measures will be at the expense of the Contractor.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

1.2 References

.1 ASTM International

.1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A123/A123-M, Specification for Zinc, (Hot Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.4 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.5 ASTM C881/C881M-02, Standard Specification for Epoxy-Resin-Base Bonding System for Concrete.

.2 CSA International

.1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-09, Design of Steel Structures.

.4 CAN/CSA-S16-01, Consolidation, (R2007), Limit States Design of Steel Structures.

.5 CSA-W47.1-03, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.7 CSA-W55.3 1965, (R2003), Resistance Welding Qualification

Code for Fabricators of Structural Members Used in Buildings.

.8 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.

.3 Environmental Choice Program
- .1 CCD-047-98(R2005), Architectural Surface Coatings.
- .2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.

.4 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - current edition.

.7 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
- .1 CISC/CPMA 2-75, Quick-Drying Primer for use on Structural Steel.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:
- .1 Submit fabrication and erection documents and material lists in

accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit drawings with Engineering content stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador.

.3 It is the responsibility of the Contractor to field confirm the exact locations and construction of related work to which work under this section connects to or is supported on.

.4 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.5 Review of shop details and erection diagrams will extend to general design concept only. This review does not relieve the Contractor of the responsibility for accuracy of the detail dimensions, general fit-up of parts to be assembled, adequacy of connection details, or for errors or defects contained in the details.

1.4 Quality Assurance

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.

.2 Anchorage Adhesive: to ASTM C881/C881M, Type IV, Grade 3, Class A, B and C:
- .1 Acceptable Products:
  - .1 Sika Anchor Fix 4 Anchoring Resin by Sika Canada Inc.
  - .2 Epcon Acrylic 7 by ITW Ramset/Red Head.
  - .3 HIT HY150 Injection Adhesive System by HILTI.
  - .4 Acrylic-Tie Anchoring System by Simpson Strong-Tie.

.3 Threaded Rod: Grade 300W to CAN/CSA G40.21.

.4 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.

.5 Welding electrodes: to CSA W48 Series.

.6 Bolts and anchor bolts: to ASTM A307.

.7 Hot Dip Galvanizing; to ASTM A123/A123M.

.8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 Fabrications

.1 Fabricate metal fabrications as indicated, in accordance with

CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Minimum fillet weld size shall be 4 mm.

.3 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.4 Use self-tapping shake-proof round headed screws on items requiring assembly by screws or as indicated.

.5 Where possible, fit and shop assemble work, ready for erection.

.6 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 Finishes

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 to CAN/CSA-G164.

.2 Galvanize fabricated components after assembly.

PART 3 - EXECUTION

3.1 General

.1 Do steel work in accordance with CAN/CSA-S16.

.2 Do welding in accordance with CSA-W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA-W47.1 for fusion welding of steel structures and/or CSA-W55.3 for resistance welding of structural components.

3.2 Examination

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Department Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

3.3 Erection

.1 Erect all miscellaneous structural steel shown on drawings, and as indicated herein, in accordance with CAN/CSA-S16 and reviewed erection drawings.

.2 Provide temporary bracing and shoring as required until permanent connections are completed.

.3 Do welding work in accordance with CSA W59 unless specified otherwise.

.4 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.5 Provide suitable means of anchorage acceptable to Department Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.6 Exposed fastening devices to match finish and be compatible with material through which they pass.

.7 Supply components for work by other trades in accordance with shop drawings and schedule.

.8 Make field connections with bolts to CSA S16.

.9 Deliver items over for casting into concrete and building into masonry together with setting templates to

appropriate location and construction personnel.

.10 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
.1 Primer: maximum VOC limit 250 g/L to GS-11.

.11 Touch-up galvanized surfaces with zinc rich primer where scratched, burned by field welding or otherwise damaged.
.1 Primer: maximum VOC limit 250 g/L to GS-11.

3.4 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.5 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END

PART 1 GENERAL

1.1 References

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)

.1 ANSI/NPA A208.1-2009, Particleboard.

.2 ASTM International

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.3 ASTM C578-11a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.4 ASTM C1289-11, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.5 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.6 ASTM D1761-06, Standard Test Methods for Mechanical Fasteners in Wood.

.7 ASTM D5055-11, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.8 ASTM D5456-11, Standard Specification for Evaluation of Structural Composite Lumber Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction and amendment.

.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 CSA International

.1 CAN/CSA-A123.2-03(R2008), Asphalt Coated Roofing Sheets.

.2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.3 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

.4 CSA O121-08, Douglas Fir Plywood.

.5 CSA O141-05(R2009), Softwood Lumber.

.6 CSA O151-09, Canadian Softwood Plywood.

.7 CSA O153-M1980(R2008), Poplar Plywood.

.8 CSA O325-07, Construction Sheathing.

.9 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2010.

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2011, Architectural Coatings.

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.8 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.2 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.4 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Framing Structural And Panel Materials

.1 Description:

.1 Sustainability Characteristics:

.1 Lumber, to CAN/CSA-Z809 or FSC or SFI certified.

.2 Plywood to CAN/CSA-Z809 or FSC or SFI certified.

.2 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 Structural Composite Lumber (SCL) in accordance with ASTM D5456.

.4 Framing and board lumber: in accordance with NBC.

.5 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade.

.6 Plywood panels: to CSA O325.

.7 Douglas fir plywood (DFP): to CSA O121, standard construction.

.8 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.9 Poplar plywood (PP): to CSA O153, standard construction.

.10 Gypsum sheathing: to ASTM C1396/C1396M.

2.2 Accessories

.1 Exterior wall sheathing paper: to CAN/CGSB-51.32 as indicated.

.2 Polyethylene film: to CAN/CGSB-51.34, as indciated.

.3 Roll roofing: to CAN/CSA A123.2, Type S.

.4 Air seal: closed cell polyurethane or polyethylene.

.5 General purpose adhesive: to CSA O112.9.

.1 VOC limit 70 g/L maximum to SCAQMD Rule 1168.

.6 Nails, spikes and staples: to CSA B111.

.7 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.8 Roof sheathing H-Clips: formed "H" shape,

thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.

.9 Fastener Finishes:

.1 Galvanizing: to ASTM A123/A123M, use galvanized fasteners for exterior work.

.10 Wood Preservative:

.1 Preservative: in accordance with manufacturer's recommendations for surface conditions:

.1 Preservative: VOC limit 350 g/L maximum to SCAQMD Rule 1113.

.2 Coatings: VOC limit 100 g/L maximum to SCAQMD Rule 1113.

PART 3 EXECUTION

3.1 Preparation

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat material as indicated:

3.2 Material Usage

.1 Roof sheathing:

.1 Plywood as indicated.

.2 Exterior wall sheathing:

.1 Plywood as indicated.

3.3 Installation

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces

of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.5 Install wall sheathing in accordance with manufacturer's printed instructions.

.6 Install roof sheathing in accordance with requirements of NBC.

.7 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.

.8 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.9 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.10 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

.11 Install sleepers as indicated.

.12 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.13 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.14 Countersink bolts where necessary to provide clearance for other work.

3.4 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 33 11 16 – Site Water Utility Distribution Piping.

.2 Section 03 30 00 – Cast-in-Place Concrete.

1.2 References

.1 American National Standards Institute (ANSI)
- .1 ANSI A208.1-09, Particleboard.
- .2 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.

.2 ASTM International
- .1 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
- .2 ASTM D2832-92(R2011), Standard Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.
- .3 ASTM D5116-10, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, (Latest Version).

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.5 CSA International
- .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture

Exposure).

.3 CSA O121-08, Douglas Fir Plywood.

.4 CSA O141-05(R2009), Softwood Lumber.

.5 CSA O151-09, Canadian Softwood Plywood.

.6 CSA O153-M1980(R2008), Poplar Plywood.

.7 CAN/CSA-Z809-08, Sustainable Forest Management.

.8 CSA O80 Series-97(R2002) - O80S2-05, Wood Preservation.

.9 CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes.

.10 CSA O80.27-1.1-M97(R2002), This Standard covers the fire-retardant treatment of Douglas Fir, hardwood, softwood, and Poplar plywood by pressure processes.

.11 CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.

.12 CSA O322-02, Procedure for Certification of Pressure-Treated Wood Materials for Use in Preserved Wood Foundations.

.6 American Wood-Preservers' Association

.1 AWPA M2-01, Standard for Inspection of Treated Wood Products.

.2 AWPA M4-06, Standard for the Care Preservative-Treated Wood

.7 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.8 Green Seal Environmental Standards (GS)

.1 GS-11-11, Paints and Coatings.

.2 GS-36-11, Commercial Adhesives.

.9 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets

(MSDS).

.10 International Organization for Standardization (ISO).
- .1 ISO 14040-2006, Environmental Management-Life Cycle Assessment - Principles and Framework.
- .2 ISO 14041-98, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.

.11 National Electrical Manufacturers Association (NEMA)
- .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

.12 National Hardwood Lumber Association (NHLA)
- .1 Rules for the Measurement and Inspection of Hardwood and Cypress 2011.

.13 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.

.14 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.15 Sustainable Forestry Initiative (SFI)
- .1 SFI-2010-2014 Standard.

1.3 Action & Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
- .1 Submit drawings containing engineering content stamped and signed by professional engineer licensed in the Province of Newfoundland and Labrador, Canada.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scale of shop drawings shall be indicated on the drawings.
.3 Indicate materials, thicknesses, finishes and hardware.
.4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.3 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 Quality Assurance

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Sustainable Standards Certification:
.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

.3 Plywood to CSA and ANSI standards.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Storage and Handling Requirements:
.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove for use and dispose of in accordance with Section 01 74 21 -

Construction/Demolition & Waste Management Disposal.

PART 2 - PRODUCTS

2.1 Materials

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
- .1 CSA O141.
- .2 CAN/CSA-Z809 or FSC or SFI certified.
- .3 NLGA Standard Grading Rules for Canadian Lumber.
- .4 AWMAC premium grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Canadian softwood plywood (CSP): to CSA O151, standard construction, CAN/CSA-Z809 or FSC or SFI certified.
- .1 Plywood resin to contain no added urea-formaldehyde.

.4 All exterior lumber to be pressure treated using either ACQ (Ammoniacal Copper Quaternary) or CA(Copper Azole) preservatives only.

.5 Nails and staples: to CSA B111.

.6 Wood screws: type and size to suit application.

2.2 Fabrication

.1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.

.2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.3 Provide cut-outs for plumbing fixtures, inserts and other fixtures.

.4 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.5 Obtain governing dimensions before fabricating items which are to accommodate or abut equipment, pipes and other materials.

2.3 Finishing

.1 Finish in accordance with red coloured exterior grade paint acceptable for wood painting.

.2 Contractor shall provide red colour samples to the Departmental Representative for their approval before choosing the paint colour.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.

.2 Visually inspect substrate in presence of the Departmental Representative.

.3 Inform Department Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 Installation

.1 Install prefinished cabinet work at locations shown on drawings.

.1 Position accurately, level, plumb straight.

.2 Fasten and anchor securely.

.1 Supply and install heavy duty fixture attachments for concrete

mounted cabinets.

.3 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.4 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.3 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean cabinet work.
- .2 Remove excess glue from surfaces.

.3 Waste Management: separate waste materials and dispose of in accordance with Section 01 74 21 - Construction/Demolition Waste Management & Disposal
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 Protection

.1 Protect cabinet work from damage until final inspection.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

END

PART 1 GENERAL

1.1 References

.1 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
  - .1 Product characteristics.
  - .2 Performance criteria.
  - .3 Limitations.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.4 Quality assurance submittals:

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Mock-Ups:

.1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.

.3 Mock-up will be used to judge workmanship, substrate preparation, and material application.

.4 Locate where directed.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with vapour barrier work.

.3 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.4 Delivery, Storage And Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Sustainable Requirements

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:

.1 Materials and resources.

.2 Storage and collection of recyclables.

.3 Construction waste management.

.4 Resource reuse.

.5 Recycled content.

.6 Local/regional materials.

.7 Low-emitting materials.

2.2 Sheet Vapour Barrier

.1 Polyethylene film: to CAN/CGSB-51.34, thickness as indicated.

2.3 Accessories

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.

.3 Staples: minimum 6 mm leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

PART 3 EXECUTION

3.1 Installation

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall and ceiling assemblies prior to installation of wallboard to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 Exterior Surface Openings

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 Perimeter Seals

.1 Seal perimeter of sheet vapour barrier as

follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets.

.2 Lap sheet over sealant and press into sealant bead.

.3 Install staples through lapped sheets at sealant bead into wood substrate.

.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 Lap Joint Seals

.1 Seal lap joints of sheet vapour barrier as follows:

.1 Attach first sheet to substrate.

.2 Apply continuous bead of sealant over solid backing at joint.

.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.

.4 Install staples through lapped sheets at sealant bead into wood substrate.

.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 Electrical Boxes

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:

.1 Install moulded box vapour barrier.

.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.6 Cleaning

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 GENERAL

1.1 Work Included

.1 Materials, removal and installation of asphalt shingles and roll roofing.

1.2 References

.1 American Society for Testing and Materials (ASTM International).

.1 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian Roofing Contractors' Association (CRCA)

.1 CRCA Roofing Specifications manual.

.3 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.

.4 Canadian Standards Association (CSA International).

.1 CAN/CSA-A123.1/A123.5-98, Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules/Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.

.2 CAN3-A123.51-M85 (R2001), Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.

.3 CAN3-A123.52-M85 (R2001), Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.

.4 CSA B111-1974 (R1998), Wire Nails, Spikes and Staples.

.5 CSA O141-05 - Softwood Lumber.

1.3 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data: Provide data indicating material characteristics, performance criteria and limitations for shingles, deck sheathing membranes, insulation and

ridge vent.

.3 Samples:

.1 Submit two (2) samples of each shingle colour indicating colour range and finish texture/pattern; for colour selection.

.2 Submit 300 mm long sample piece of metal flashing in specified colour.

.4 Manufacturer's Instructions: Indicate installation criteria and procedures for installation of asphalt shingles.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Extra Stock Materials

.1 Provide one unopened bundle of shingles from same production run and dye lot as shingles installed.

.2 All unused shingles remain property of Parks Canada.

1.7 Warranty

.1 Provide Warranty guaranteeing workmanship related to the installation of the roofing system will remain leak proof for a period of five (5) years from the date of Interim Completion.

PART 2 PRODUCTS

2.1 Roofing Materials

.1 Glass Mat Shingles: to CSA A123.5, laminated, glass fibre mat reinforced:

- .1 Average net mass per area of finished shingles: 122kg/10m3 minimum
- .2 Warranty: 40 years
- .3 High Wind Warranty: 130 km/h
- .4 3-tab shadow profile.
- .5 Colour: As selected by Engineer
- .6 Acceptable Product:
  - .1 BP Everest,
  - .2 CRC Biltmore LT,
  - .3 GAF-ELK Timberline Prestique

.2 Underlayment: No. 15 felt paper.

.3 Eave and Valley Protection: Self-adhering membrane, slip resistant surface, minimum thickness 1.0 mm, provide complete with primer;

- .1 Acceptable Products:
  - .1 Grace Ice & Water Shield,
  - .2 Bakor Eaveguard,
  - .3 IKO Gold Shield,
  - .4 Soprema Lastobond Shield.

.4 Valley Metal Protection:

- .1 Pre finished metal, to cover flashing noted in item 2.2.

2.2 Flashing Materials

.1 Pre-painted Galvanized Steel Sheet, supplied by this section

.2 Exposed Fasteners: Plastic-covered or pre-painted socket head, self drilling screws.

- .1 Head colour to match sheet metal.

2.3 Accessories

.1 Starter strip

- .1 Pre finished aluminum.

.2 Vent stack covers/boots: telescoping cap and pre-insulated flange sleeve of aluminum, sized to suit vents.

.3 Plastic Cement: to CAN/CGSB-37.5.

.4 Shingle Nails: to CSA B111, round wire shingle type, hot dip galvanized steel, 10 or 12 gauge, barbed or deformed shank, minimum 9.5 mm head diameter, sufficient length to just penetrate through nailable sheathing.

.5 Eavestroughing: Metal length as shown on drawings, properly mounted on building, provide slope. Eavestroughing to be on both sides of building, and include drip edge.

.6 Ridge Vents:

.1 Acceptable products for ridge vents shall be Cor-A-Vent V-400E Ridge Ventilation System, Duraflo WeatherPro, Omniridge by Lomanco or approved equal.

2.4 Flashing Fabrication

.1 Form flashings to profiles indicated on Drawings, and to protect roofing materials from physical damage and shed water.

.2 Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

.3 Hem exposed edges of flashings minimum 6 mm on underside.

PART 3 EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt shingles installation in accordance with manufacturer's written instructions.

.2 Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

.3 Verify roof openings are correctly framed.

.4 Verify deck surfaces are dry, free of

ridges, warps, or voids.

3.2 Preparation

.1 Fill knot holes and surface cracks with latex filler at areas of bonded eave protection. Cover knot holes with galvanized sheet metal.

.2 Broom clean deck surfaces under eave protection and underlayment.

3.3 Installation – Eave And Valley Protection

.1 Place eave drip edge and gable drip edge metal flashings tight with facia boards.

.1 Weather lap joints 50 mm and seal with plastic cement.

.2 Secure flange with nails spaced 450 mm on centre.

.2 Install self-adhering membrane using primer in accordance with manufacturer's written instructions.

.3 Lap joints minimum 100 mm.

.4 Extend eave protection membrane starting at the roof /facia edge, up-slope a minimum 1800 mm beyond the inside face of exterior walls and as indicated.

.5 Extend valley protection membrane up-slope, first 900 mm wide sheet centred in valley and one 1800 mm sheet on each side of valley beginning at bottom and lapping 100 mm onto the centre sheet.

.1 Install in shingle fashion, lapping minimum 100 mm.

.2 Install pre-finished sheet metal flashing cover.

3.4 Installation - Underlayment

.1 Place felt underlayment over entire roof area and as second layer over eave and valley protection, with ends and edges weather lapped minimum 100 mm.

.1 Lap valley flashings minimum 100 mm.

.2 Stagger end laps of each consecutive layer.

.3 Back nail in place in laps only.

.2 Install underlayment perpendicular to

slope of roof.

.3 Weather lap and seal watertight with plastic cement items projecting through or mounted on roof.

3.5 Installation - Metal Flashing And Accessories

.1 Weather lap joints minimum 50 mm and seal weather tight with plastic cement.

.2 Secure in place with nails at 100 mm on centre. Conceal fastenings.

.3 Flash and seal work weather tight, projecting through or mounted on roofing with plastic cement.

3.6 Shingle Application

.1 Match lines and placement of existing roofing to remain.

.2 Do asphalt shingle work in accordance with CAN3-A123.51, CAN3-A123.52 and CRCA Specification except where specified otherwise.

.3 Install shingles in accordance with manufacturer's written instructions using nails.

.1 Staples not acceptable.

.4 Install shingle starter strip in accordance with manufacturer's written instructions.

.5 Project first course of shingles 19 mm beyond fascia boards.

.6 Extend shingles 13 mm beyond face of gable edge fascia boards.

.7 Extend shingles on one slope across valley and fasten.

.1 Trim shingles from other slope 50 mm from valley centre line to achieve closed cut valley, concealing the valley protection.

.8 Install ridge ventilation where indicated.

.1 Provide gap in roof sheathing at ridge as required by vent manufacturer.

.9 Cap hips and ridges with individual

shingles, maintaining 125 mm weather exposure.

.1 Place to avoid exposed nails.

.10 Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counter flashings.

.11 Complete installation to provide weather tight service.

3.7 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 Protection

.1 Do not permit traffic over finished roof surface.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by asphalt shingles installation.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 06 10 00 - Rough Carpentry

.2 Section 07 26 00 – Vapour Retarders

.3 Section 07 31 13 – Asphalt Shingles

.4 Section 08 11 00 – Metal Doors and Frames

1.2 References

.1 American National Standards Institute (ANSI)
- .1 ANSI A135.6-06, Hardboard Siding Standard.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CSA International
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O121-08, Douglas Fir Plywood.
- .3 CSA O151-09, Canadian Softwood Plywood.
- .4 CAN/CSA-Z809-08, Sustainable Forest Management.

.4 National Lumber Grading Authority (NLGA)
- .1 NLGA Standard Grading Rules for Canadian Lumber 2010.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.

.3 Samples:
- .1 Submit duplicate 600 mm long samples of all profiles used.
- .2 Submit two 2 samples; 300 mm x 300 mm of air barrier material.

.4 Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.4 Quality Assurance

.1 Product Data
- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect wood siding from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 Materials

.1 Lumber siding: to NLGA Standard Grading Rules for Canadian Lumber.
- .1 Siding:
  - .1 Species: Western Lodgepole pine
  - .2 Kiln Dried
  - .3 Grade: No 1; Defected to eliminate knot holes and end splits
  - .4 Pre-Finished: Two-coat 100% acrylic system on five sides (one coat on back)

.5 Colour: From manufacturer's complete ranges; no restrictions.

.2 Specialty panels: Same as siding

.3 Warranty: 15-year limited coating.

.4 Acceptable model and manufacturer:

.1 Siding: Cape Cod – Marwood: CCS71582.

.2 Trim: Cape Cod – Marwood: CCS31523.

.2 Accessories: exposed trim, closures, cap pieces of manufacturer's standard, finish same as siding.

.3 Strapping: to Section 06 10 00 Rough Carpentry.

.1 Slope strapping for drainage for vertical siding

.4 Exterior wall air barrier: to Section 07 26 00.

.5 Fasteners: Siding and trim nails to CSA B111, hot galvanized steel, or stainless steel sized as required, spiral or ring thread type with oval finishing head.

.6 Attic vent strip: 38 and 50 mm wide continuous vinyl vent strip;

.1 Acceptable manufacturers:

.1 Vinylcorp

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 Installation

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Install strapping, sill flashings, wood starter strips, inside corner flashings, edgings and flashings over openings.

.3 Fasten wood siding in straight, aligned lengths to furring using two 2 nails at each fixing location.

.1 Stagger butt joints not less than 800 mm and distribute evenly over wall faces.

.2 Cut butt joints at 45 degrees and for vertical siding slope to outside.

.3 Seal cut surfaces.

3.4 Cleaning

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by wood siding installation.

END

PART 1 GENERAL

1.1 References

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)

- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)

- .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 South Coast Air Quality Management District (SCAQMD), California State

- .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.6 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre,

for Buildings.

.3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.

.5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 System Description

.1 Design Requirements:

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.3 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit drawings.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, arrangement of hardware and finishes.

.3 Indicate each type frame material, core thickness, reinforcements, location of anchors and exposed fastenings finishes.

.4 Submit test and engineering data, and installation instructions.

.4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.

1.4 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Materials

.1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

2.2 Door Core Materials

.1 Polystyrene Core:

.1 Rigid extruded fire retardant, closed cell board, density 16 to 32 kg/m³, thermal values RSI 1.0 minimum, Type 1, in accordance with CAN/ULC-S701.

2.3 Adhesives

.1 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 Primer

.1 Touch-up prime CAN/CGSB-1.181.

.1 Maximum VOC limit 50 g/L to GC-03.

2.5 Paint

.1 Field paint steel doors and frames in accordance with Section 09 91 99 - Painting. Protect weatherstrips from paint. Provide final finish free of

scratches or other blemishes.

.1 Maximum VOC emission level 50 g/L to SCAQMD Rule 1113.

2.6 Accessories

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 Door bottom seal: as indicated

.4 Metallic paste filler: to manufacturer's standard.

2.7 Frames Fabrication General

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames: 1.2 mm welded type construction.

.4 Interior frames: 1.2 mm welded type construction.

.5 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.6 Protect mortised cutouts with steel guard boxes.

.7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.8 Manufacturer's nameplates on frames and screens are not permitted.

.9 Conceal fastenings except where exposed fastenings are indicated.

.10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.11 Insulate exterior frame components with polyurethane insulation.

2.8 Frame Anchorage

.1 Provide appropriate anchorage to floor

and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.9 Frames: Welded Type

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 Door Fabrication General

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: honeycomb construction.

.3 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketting and hardware in accordance with ASTM E330.

.4 Blank, reinforce, drill doors and tap for mortised, templated hardware.

.5 Factory prepare holes 12.7 mm diameter

and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.7 Manufacturer's nameplates on doors are not permitted.

2.11 Doors: Polystyrene Core Construction

.1 Form face sheets for exterior doors from 1.6 mm sheet steel with polystyrene core laminated under pressure to face sheets.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Installation General

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.3 Frame Installation

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are

not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier.

3.4 Door Installation

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.2 Provide door hardware as approved by Departmental Representative.

.3 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.4 Adjust operable parts for correct function.

3.5 Finish Repairs

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END

PART 1 – GENERAL

1.1 RELATED WORK

.1 Section 08 11 00 - Metal Doors and Frames.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute, ANSI

.2 NBCC - National Building Code of Canada Latest Adopted Edition

.3 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s instructions, printed product literature, specifications and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Samples:

.1 Upon Consultant request submit samples of door hardware in accordance with Section 01 33 00.

.2 Samples will be returned for inclusion into work.

.3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.4 After approval samples will be returned for incorporation in Work.

.4 Hardware List:

1. Submit contract hardware list.
2. Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.4 WARRANTY

.1 Warranty start date is from substantial completion.

.2 No liability is to be assumed where damage is due to improper installation, usage or abuse.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Meet requirements of National Building Code of Canada and other applicable regulations.

.3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer’s installation instructions and manufacturer’s warranty requirements.

.6 Upon completion of finish hardware installation, hardware supplier shall inspect work and shall certify in writing that all items and their installation are in accord with requirements of Contract Documents and are functioning properly.

1.6 PRODUCT DELIVERY, HANDLING & STORAGE

.1 Packing, Shipping, Handling and Unloading:

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, with necessary screws, keys, instructions and installation templates.

.3 All items of hardware should be itemized and tagged as per the approved Finish Hardware Schedule.

.4 Shortages will not delay installation.

.5 Items damaged in shipment will be replaced properly with proper material.

.6 All Hardware shall be handled in a manner to avoid damage, marking and scratching.

.7 Hardware is to be inventoried on site and confirmed by the Contractor and Hardware Supplier.

.2 Storage and Protection:

.1 Store hardware in locked, clean and dry area.

1.7 MAINTENANCE

.1 Provide maintenance materials.

.2 Provide three sets of maintenance tools for closers, locks and exit devices as well as a complete set of installation instructions.

.3 After the building is occupied, arrange for an appointment with the owner to instruct them of proper use, service, adjusting and maintenance of the hardware furnished in this section.

.4 Extra material if required.

1.8 INSPECTION

.1 The hardware supplier shall arrange at least one visit to the job site.

.1 Site visit shall take place just prior to building turnover. Co-ordinate with general contractor and Consultant to determine proper time for visit. All

hardware shall be checked for proper installation and adjustment. Any errors shall be corrected, and adjustments made. Check the key system and furnish a report along with maintenance manuals detailing any errors found.

.2 Cost of this service will be included as part of this Section and is not covered by any allowance amount.

PART 2 -PRODUCTS

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for all similar items.

2.2 DOOR HARDWARE SCHEDULE

.1 Door Hardware – Single Door (Exterior):

.1 Door Hardware shall conform to the following schedule or approved equal (hardware per door):

.1 3 ONLY HINGES FBB191 114 x 101 x NRP x C15
.2 1 ONLY LOCKSET 7825-OB x C26D
.3 1 ONLY DOOR CLOSER EN350-OZ x EN350-B DROP PLATE
.4 1 ONLY HOLD OPEN DEVICE 590H x 26D
.5 1 ONLY DOOR SWEEP W13S x DOOR WIDTH
.6 1 SET WEATHERSTRIP W49 x SIZE TO SUIT
.7 1 ONLY THRESHOLD CT39 x DOOR WIDTH (TOTAL)

2.3 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through

which they pass.

2.4 KEYING

.1 Doors, padlocks and cabinet locks to be keyed alike in groups as directed.

.2 Provide three(3) sets of keys for every lock in this contract, master keyed to Parks Canada standard key type.

.3 Keys shall be of nickel silver and shall be furnished by the lock manufacturer.

.4 Stamp keying code numbers on keys and cylinders

.5 Supply construction cores.

.6 Hand over permanent cores and keys to Consultant.

.7 All locks to be masterkeyed to the existing Sargent factory registered masterkey system. All locks to be masterkeyed as per the owners instructions. Cylinders to be Sargent Signatures Series Interchangeable Core keyed alike on a separate Master Key System.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

.5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.6 Install key control cabinet.

.7 Use only manufacturer's supplied fasteners.
.1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.8 Remove construction locks when directed by Consultant.
.1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
.2 Lubricate hardware, operating equipment and other moving parts.
.3 Adjust door hardware to provide tight fit at contact points with frames.
.4 All defective or damaged hardware will have to be repaired or replaced at the contractors expense.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.2 Leave Work area clean at end of each day.
.3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
.4 Remove protective material from hardware items where present.
.5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

3.4 DEMONSTRATION

.1 Maintenance Staff Briefing:

.1 Brief maintenance staff regarding:

.1 Proper care, cleaning, and general maintenance of projects complete hardware.

.2 Description, use, handling, and storage of keys.

.3 Use, application and storage of wrenches for door closers locksets and fire exit hardware.

.2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

END

PART 1 – GENERAL

1.1 Related Sections

.1 This section covers items common to all sections of division 20, 22 and 23

1.2 References

.1 All codes and standards to be of latest addition.

1.3 Scope of Work

.1 The work to be performed under this section consists of the construction of the general mechanical works related to the building in accordance with the lines and dimensions shown on the drawings or as described in these specifications or as directed by the Engineer.

.2 The Contractor shall provide all supervision, labour, materials, equipment, machinery, plant and all other items necessary to complete all mechanical systems.

1.4 Measurement

.1 The Mechanical system to be measured for payment will be by lump sum including this installation, material, mechanical equipment and execution. Measurement shall be in accordance with the Tender Form.

1.5 Payment

.1 Payment for work under this item shall be at the contract unit price for each category (as detailed below and in the list of work items and cost date in Tender Form) and include the supply and transportation of all materials and labour, testing, start-up, mechanical identification, commissioning, O&M manuals, clean-up and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer.

.2 MECHANICAL SYSTEM UPGRADES shall include pipe and fittings, valves, gravity check valves, gauges, pressure switch, flow meters, pressure tank, spare parts, start-up, testing, O & M manuals, clean-up, and all work incidental thereto, all as specified or as shown on the drawings or as laid out by the Engineer

1.6 Permits

.1 In accordance with the General Conditions, obtain and pay for permits, certificate, licenses and other permits including environmental permit for fuel tank as required by municipal, provincial and federal authorities.

.2 Provide appropriate notifications of project to municipal and provincial inspection authorities.

.3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.

.4 Submit to Engineer, copy application forms and approval documents received from above referenced authorities.

1.7 Action and Information Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:
  .1 Submit drawings stamped and signed by professional engineer registered or licensed in New Brunswick, Canada for the following products.
    .1 Pipe and fittings, valves,

gravity check valves, gauges, pressure switch, flow meters, pressure tank.

.2 Drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.6 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section

1.8 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment

failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Consultant will provide 1 set of reproducible mechanical drawings. Contractor to provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to

reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-Built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for Ventilation, and Plumbing, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for Ventilation and Plumbing using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.9 Maintenance Material Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.10 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 Materials

.1 All material and equipment supplied under this contract shall be from local suppliers (NFLD) unless approved by Engineer during tender.

PART 3 – EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Consultant.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 Painting Repairs and Restoration

.1 Do painting in accordance with manufacturer recommendations.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 System Cleaning

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 Demonstration

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Contractor will record these demonstrations on video tape for future reference.

3.5 Commissioning

.1 This Contractor shall provide a start-up/commissioning report prior to final inspection confirming that all major pieces of equipment have been started in accordance with manufacturer’s instructions. Report shall list each piece of equipment and shall include the name of the inspection authority giving permission for equipment start-up where applicable. Report must be signed and dated. Reports are required but not limited to the following equipment:

.1 Process Piping instruments.

.2 The services of a factory-trained representative shall be provided for a minimum period of one (1) day to provide initial start-up of the all components of the new facility, and to instruct the Owner's operating personnel in the operation and maintenance of the equipment. This shall be included in the price for Mechanical.

.3 Provide commissioning as specified in Section 01 91 13 - General Commissioning (CX) Requirements

3.6 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 Protection

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END

PART 1 – GENERAL

1.1 Summary

.1 Section Includes:
- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
- .2 Sustainable requirements for construction and verification.

.2 Related Requirements
- .1 Section 22 & 23

1.2 Measurement and Payment

.1 Refer to section 20 05 01 – Common Work Results for Mechanical.

1.3 References

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

1.4 Submittals

.1 Product Data:

.2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.5 Delivery, Storage and Handeling

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Dispose of unused paint and coating material at official hazardous material collections site approved by Departmental Representative DCC Representative Consultant.
- .3 Do not dispose of unused paint and coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

PART 2 – PRODUCTS

2.1 Manufacturer’s Equipment Nameplates

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
- .1 Equipment: manufacturer's name, model, size, serial number, capacity.
- .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 System Nameplates

.1 Colours:
- .1 Hazardous: red letters, white background.
- .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
- .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
- .1 Conform to following table:
- .2 Use maximum of 25 letters/numbers per line.

.4 Locations:
- .1 Terminal cabinets, control panels: use size # 5.
- .2 Equipment in Mechanical Rooms: use size # 9.

2.3 Identification of Piping Systems

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
- .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
- .2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 Other pipes: pressure sensitive plastic-coated cloth vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:
- .1 Where not listed, obtain direction from Departmental Representative DCC Representative Consultant.
- .2 Colours for legends, arrows: to following table:

2.4 Valves, Controllers

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.5 Controls Components Identification

.1 .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.6 Language

.1 .1 Identification in English and French.

.2 Use one nameplate and label for each language both languages.

PART 3 – EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Timing

.1 Provide identification only after painting specified Section 09 91 99 - Painting has been completed.

3.3 Installation

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC CSA registration plates as required by respective agency.

3.4 Nameplates

.1 Locations:
  .1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
  .1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
  .1 Do not paint, insulate or cover.

3.5 Location of Identification on Piping

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking

aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 Valves, Controllers

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Engineer. Provide one copy (reduced in size if

required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 Backfill types and compaction

.1 Use types of backfill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.

.1 Aggregate Base Courses (for access roads and paths): compact to 95% of maximum dry density.

.2 Fill Against Structure: compact to 95% of maximum dry density.

.3 Select Backfill Material: compact to 95% of maximum dry density.

3.8 Cleaning

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

3.1 PART 1 – GENERAL

1.1 Related Requirements

.1 Section 01 33 00 – Submittal Procedures

.2 Section 33 11 16 – Site Water Distribution Piping

.3 Section 33 31 13 – Public Sanitary Utility Sewerage and Piping

.4 Section 20 05 53.01 – Mechanical Identifications.

1.2 References

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 Canadian Standards Association (CSA International)
- .1 CSA B139-04, Installation Code for Oil Burning Equipment.

.3 Green Seal Environmental Standards (GSES)
- .1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.

.4 National Fire Code of Canada (NFCC 2005).

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 Quality Assurance

.1 Sustainability Standards Certification:
- .1 Low-Emitting Materials: provide listing of sealants and coatings used in building, comply with VOC and chemical component limits or restriction requirements.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements:
.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 Material

.1 Paint: zinc-rich to CAN/CGSB-1.181.
.1 Primers, Paints and Coating: Apply in accordance with manufacturer's recommendations for surface conditions.

PART 3 - EXECUTION

3.1 Application

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Connection to Equipment

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 Clearances

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as

recommended by manufacturer, National Fire Code of Canada and CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer and CSA B139, or as indicated without interrupting operation of other system, equipment, components.

3.4 Drains

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.
.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 Dielectric Couplings

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.6 Pipework Installation

.1 Install pipework to CSA B139.

Install pipework to CSA B182.11.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

Assemble piping using fittings manufactured to CSA standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
  .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

Remove scale and other foreign material before assembly.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:
  .1 Install in accessible locations.
  .2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.
.4 Valves accessible for maintenance without removing adjacent piping.
.5 Use ball valves at branch take-offs for isolating purposes except where specified.

3.7 Sleeves

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:
.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
.2 Other floors: terminate 25 mm above finished floor.
.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:
.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
.2 Elsewhere:
.1 Provide space for firestopping.
.2 Maintain fire rating integrity.
.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
.4 Ensure no contact between copper pipe or tube and sleeve.

3.8 Flushing Out of Piping System

.1 Flush system in accordance with applicable code.

3.9 Pressure Testing of Equipment and Pipework

.1 Advise Department Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 2 hours minimum unless specified for longer period of time in relevant mechanical sections and provide written confirmation to the Department Representative.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Pay costs for repairs or replacement, retesting, and making good. Department Representative to determine whether repair or replacement is appropriate.

.6 Insulate or conceal work only after approval and certification of tests by the Department Representative.

3.10 Escutcheons

.1 Install of pipes passing through walls, partitions, floors, and ceiling in finished areas.

.2 Construction: one piece type with set screws.
  .1 Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.
  .1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.11 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 22 05 05 – Installation of Pipework

1.2 References

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.1-2007, Power Piping.
- .2 ANSI/ASME B31.3-2006, Process Piping.
- .3 ANSI/ASME Boiler and Pressure Vessel Code-2007:
  - .1 BPVC 2007 Section I: Power Boilers.
  - .2 BPVC 2007 Section V: Nondestructive Examination.
  - .3 BPVC 2007 Section IX: Welding and Brazing Qualifications.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C206-03, Field Welding of Steel Water Pipe.

.3 American Welding Society (AWS)
- .1 AWS C1.1M/C1.1-2000(R2006), Recommended Practices for Resistance Welding.
- .2 AWS Z49.1-2005, Safety in Welding, Cutting and Allied Process.
- .3 AWS W1-2000, Welding Inspection Handbook.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.
  - .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .3 CSA B51-03(R2007), Boiler, Pressure Vessel and Pressure Piping Code.
  - .4 CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
  - .5 CSA W178.1-2008, Certification of Welding Inspection Organizations.
  - .6 CSA W178.2-2008, Certification of Welding Inspectors.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.4 Quality Assurance

.1 Qualifications:
- .1 Welders:
  - .1 Welding qualifications in accordance with CSA B51.
  - .2 Use qualified and licensed welders possessing certificate from the province of Newfoundland for each procedure performed from authority having jurisdiction.
  - .3 Submit welder's qualifications to Department Representative.
  - .4 Each welder to possess identification symbol issued by authority having jurisdiction.
  - .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
- .2 Inspectors:
  - .1 Inspectors qualified to CSA W178.2.
- .3 Certifications:
  - .1 Registration of welding procedures in accordance with CSA B51.
  - .2 Copy of welding procedures available for inspection.
  - .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.
  - .4 Welder and Mechanical Contractor shall have a valid Newfoundland provincial welding license.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 – PRODUCTS

2.1 Electrodes

.1 Electrodes: in accordance with CSA W48 Series.

PART 3 – EXECUTION

3.1 Application

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Quality of Work

.1 Welding: in accordance with ANSI/ASME B31.1 and B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, special procedures specified elsewhere in Division 22 and applicable requirements of provincial authority having jurisdiction.

3.3 Installation Requirements

.1 Identify each weld with welder's identification symbol.

.2 Backing rings:
- .1 Where used, fit to minimize gaps between ring and pipe bore.
- .2 Do not install at orifice flanges.

.3 Fittings:
- .1 NPS 2 and smaller: install welding type sockets.
- .2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 Inspection and Tests – General Requirements

.1 Review weld quality requirements and defect limits of applicable codes and standards with Department Representative before work is started.

.2 Formulate "Inspection and Test Plan" in co-operation with Department Representative.

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 Specialist Examinations and Tests

.1 General:

.1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Department Representative.

.2 Inspect and test 5 % of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination magnetic particle (hereinafter referred to as "particle") tests spot full gamma ray radiographic (hereinafter referred to as "radiography") tests.

.2 Hydrostatically test welds to ANSI/ASME B31.1.

.3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.4 Failure of visual examinations:

.1 Upon failure of welds by visual examination, perform additional testing as directed by Department Representative of total of up to 10% of all welds, selected at random by Department Representative by radiographic means. All

radiographic testing will be carried out at contractor's expense.

3.6 Defects Causing Rejection

.1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

3.7 Repair and Welds Which Failed Tests

.1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.8 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END

PART 1 – GENERAL

1.1 Summary

.1 Section Includes:
- .1 Materials and components for metering potable water including installation.

.2 Related Sections:
- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 23 05 17 – Pipe Welding.

1.2 References

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME Fluid Meter's Handbook: Their Theory and Application, Sixth Edition 1971.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 Action and Informational Submittals

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.3 Submittals to include:
- .1 Piping configuration and sizing - straight pipe upstream and downstream, distances to first weld, protrusion, thermowell, pressure tap.
- .2 Service conditions.
- .3 Full details of primary element - standard of design and construction, materials, type serial number, flow rate, differential pressure, irrecoverable head loss (IHL), calculation sheets.
- .4 Accuracy statements for each component at specified flow rates and other conditions.
- .5 Flow and temperature ranges.

.6 Signal processor calibration data.
.7 Minimum turndown ratio.

.4 Samples:
.1 Submit sample in accordance with Section 01 33 00 - Submittal Procedures.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals:
.1 Submit maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

1.4 Delivery, Storage and Handling

.1 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 Ultrasonic Level Transducer and Controller

.1 The ultrasonic transducers shall be installed inside the new above ground water reservoir to measure the water level inside the reservoir. The scope of the mechanical work shall include supports and anchoring inside the water reservoir as per the Manufacturer’s recommendations and all related work for a complete installation. The facility start-up shall include the calibration and commissioning of this unit by a trained factory representative.

.2 A total of one (1) ultrasonic transducer (mounted inside the water reservoir) and one (1) controller mounted inside the existing water pumping station building shall be installed. The controller shall show water reservoir level and shall also provide a 4-20 mA signal output to the pumphouse control panel PLC.

.3 The ultrasonic transducer shall be Siemens Milltronics Echomax XRS-5 transducer with the approx. 70m of control cable (to be confirm on site by contractor), part number 7ML1106-1BA20-0A.

.4 The transducer shall be mounted inside the water reservoir near the access hatch at top for easy maintenance.

.5 The ultrasonic level controller shall be Siemens Sitrans LUT420 Part Number 7ML5050-0AA11-1DA0.

.6 The ultrasonic level controller shall be wall mounted inside the existing water pumping station. Exact location to be confirm on-site during construction.

.7 Or approved alternate.

2.2 Pressure Gauges

.1 Gauge installations shall be complete with all tubing and fittings, and shall include a shut off valve, tee and nut (clean-out) installed in each gauge inlet at the point of connection to suction and discharge pipes.

.2 Gauges to be glycerine filled.

.3 Dual indication dial range: 270° – 0 to 145 psi (0 to 1000 kPa) to be white with black figures and gradations c/w clear glass window.

.4 Dial size: 100 mm (4”).

.5 Case, ring and pointer: Stainless steel.

.6 Accuracy: 1% of full scale reading.

.7 Acceptable product: US Ametek or approved equal.

2.3 Water Metering

.1 Type of metering: High Performance Turbine Meter

.2 Design data:
- .1 Flow rates: 0-1.9 L/s (0-30 USgpm)
- .2 Pressure Rating: 175 PSIG
- .3 Water Temperature 0-25 °C

.3 Flow Transmitter shall be mounted between the meter main case and the register.

.4 Diameter of main for installation of primary element: as noted on the drawings.

.5 Read-out instrument display options:
- .1 Water flow rate: Usgpm or m^3/h
- .2 Total flow: USGal., or Imp. Gal.

.6 Signal transmission between primary measuring element and signal conditioners:
- .1 Power: 26.5 VCC powered.
- .2 Signal: Electronic pulse output and 4-20 mA output.
- .3 Cable: colour coded, twisted and shielded pair with grounding wire.

.7 Additional Requirements:
- .1 The maincase and cover shall be cast from NSF/ANSI 61 and NSF/ANSI 372 certified lead free alloy.
- .2 Casing bolts to be Type 316 Stainless Steel.
- .3 The size, model, NSF certification and arrows indicating direction of flow shall be cast in raised characters on the maincase or cover.
- .4 Flow meter shall be CSA approved, field programmable, NEMA 4X enclosure, complete with polyurethane liner, designed to measure flow for clean potable water, with flow rates varying.
- .5 Registration accuracy over the normal operating range shall be 98.5% to 101.5%
- .6 Meter shall be certified to NSF/ANSI 61 and NSF/ANSI 372 requirements.

.7 The turbine measuring chamber shall be a self-containedunit attached to the cover for easy removal. The turbine spindles shall be stainless steel; turbine shafts shall be tungsten carbide.

.8 All meters shall be equipped with encoder remote registers per AWWA C707 and meet all AWWA C701 performance standards.

.9 All moving parts of the gear train shall be made of a self-lubricating polymer or stainless steel for operation in water.

.10 Flange: Maincases shall be flanged. 11 ⁄2" and 2" sizes shall be oval flanged and 3" through 10" sizes shall be round flanged per Table 3, AWWA C701.

.11 Flow meter shall be supplied with a factory calibration certificate.

.12 Acceptable Products: Neptune High Performance Turbine meter c/w TRICON/E3 transmitter or approved equal.

PART 3 - EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Installation of Primary Element

.1 Follow manufacturer's instructions.

3.3 Installation of Signal Transmission Cable

.1 Ground shielding at one point only.

.2 Protect against RF interference.

.3 Cross electrical cables, conduits at 90 degrees leaving at least 150 mm space between.

3.4 Start-Up

.1 Follow manufacturer's recommendations.

3.5 Cleaning

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 References

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers(ASME)

- .1 ASNI/ASME B1.20.1-1983 (R2006), Pipe Threads, General Purpose (Inch.)
- .1 ASME B16.1-05, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25,125 and 250.
- .2 ANSI/ASME B16.5-03, Pipe Flanges and Flanged Fittings: NPS through 24.
- .3 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Fittings.
- .4 ANSI/ASME B16.34-04, Valves - Flanged, Threaded and Welding Ends.

.2 ASTM International Inc.

- .1 ASTM A126-04), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .2 ASTM A536-84(2004)e1, Standard Specification for Ductile Iron Castings.
- .3 ASTM A276-08, Standard Specification for Stainless Steel Bars and Shapes.
- .4 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .5 ASTM B283-08a, Standard Specification for Copper and Copper and Alloy Die Forgings (Hot-Pressed).
- .6 ASTN B505/B505M-08a, Standard Specification for Copper-Base Alloy Continuous Castings.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

- .1 MSS SP-67-02a, Butterfly Valves.

1.3 Action and

Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheets for valves and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit data for valves specified in this section.

.3 Shop Drawings:
- .1 Submit shop drawings and product data in accordance

1.4 Closeout Submittals

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 Delivery, Storage and Handling

.1 Packaging Waste Management: remove of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Delivery and acceptance Requirements:
- .1 Deliver material to site in original factory packaging, labelled with manufacturer’s name, address.

1.6 Maintenance Material Submittals

.1 Furnish following spare parts:
- .1 Valve seats: one for every 10 valves each size, minimum 1.
- .2 Stem packing: one for every 10 valves, each size, minimum 1.
- .3 Gaskets for flanges: one for every 10 flanged joints, minimum 2.

PART 2 – PRODUCTS

2.1 Butterfly Valves – Resilient Seat

.1 Butterfly valves shall be sized in accordance with the drawings. Valves shall be butterfly valve type

and complete with flange end connections with the following specifications:

.1 One (1) Piece Body: Ductile Iron to ASTM A536 or Cast Iron to ASTM A126 Class B;
.2 Type: Full Lug;
.3 Seat Material: EPDM;
.4 Disc Material: Stainless Steel 316;
.5 Shaft Material: Stainless Steel 316;
.6 Taper pine Disc shall not be pinned to shaft;
.7 Key: 316 Stainless Steel;
.8 Coating: Fused bonded epoxy coating or polyester coating suitable for exterior application;
.9 Nuts and Bolts: Stainless Steel 316;
.10 Operator: Leaver Type with 10 position S.S. plate for valves 100mm or smaller.
.11 Acceptable Product: Series 31 Bray butterfly valve or approved equal.

2.2 PVC Ball Valve

.1 Connections: ANSI 150 Flanged PVC end to ANSI B16.5 or Female NPT Threaded PVC to ASTM D2464, ASTM 1498 and ANSI B1.20.1.

.2 Min Pressure Rating: 150 PSI

.3 Body, Ball and Stem: PVC according to ASTM D1784

.4 Seat: PTFE listed with NSF 61

.5 O-ring Seals : EPDM listed with NSF 61

.6 Full port Bidirectionnel valve

.7 Acceptable Product: Ipex VXE Series Ball Valve or approved alternate.

2.3 Check Valves

.1 All valves to be coated internally and externally with an ANSI/NSF61 approved fusion bonded epoxy suitable for potable drinking water. All valves to be color coded blue. Related nuts and bolts required on valve body shall be stainless steel 316. Valves shall be sized in accordance with the drawings and suitable for potable water application.

.1 Type: Flex-Check-Valve;
.2 Operating pressure range: 0-175 PSI;
.3 Body Type: Full flanged type in

accordance with ANSI B16.1, Class 150 and c/w domed access cover;

.4 Body Material: Ductile Iron to ASTM A536 Grade 65-45-12;

.5 Cover Material: Ductile Iron to ASTM A536 Grade 65-45-12;

.6 Disc Material: Buna-N to ASTM D20000-BG;

.7 Disc Construction: One (1) piece construction, precision molded with an integral O-ring type sealing surface and contain steel and nylon reinforcement;

.8 No. of moving part: One (1), flexible valve disc;

.9 The valve body shall have a full flow equal to nominal pipe diameter at any point through the valve (full internal port);

.10 Seating surface angle: to minimize disc travel @ 45°;

.11 Top access port of the body shall be full size, allowing removal of the disc without removal of the valve from the pipeline;

.12 Valve to be manufactured and tested in accordance with ANSI/AWWA Standard C-508;

.13 Non-Slam closure type with drip tight seating;

.14 Valve shall pass spherical solids equal to the pumps capability, minimum 75 mm spherical solid;

.15 The disc shall have a 25 year warranty;

.16 The valve disc shall be cycle tested 1 000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear. The test results shall be independently certified;

.17 A mechanical indicator shall be provided to indicate open/closed position on all supplied valves;

.18 Valve shall come ready for future installation of back flow actuator if needed. The back flow actuator shall be capable of being installed in the field without removal of the valve from the main line;

.19 Identification tag: fastened to cover;

.20 Acceptable Product: Cla-Val Model 8802WN , Val-Matic Series 88 or approved

equal;

.21 Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valves other than full flow type or valves mounted in such a manner that prevents the passage of 75 mm spherical solid shall not be acceptable.

2.4 Strainers

.1 Strainers to be coated internally and externally with an ANSI/NSF61 approved fusion bonded epoxy suitable for potable water drinking. Strainers to be colour coded blue. Related nuts and bolts required on valve body shall be stainless steel 316. Valves shall be sized as per drawings and suitable for potable water application.

.1 Ends: Flanged, ANSI Class 150;

.2 Max Pressure Rating: 300 PSI;

.3 Body and Cover: Ductile Iron ANSI B16.42 with Fusion Bonded Epoxy Coating;

.4 Cover Seal: Buna-N Synthetic Rubber;

.5 Strainer: 316 Stainless Steel;

.6 Strainer Mesh Sizes: Opening 0.078 inch;

.7 Acceptable Product: Neptune Technology Group or approved equal.

2.5 Air Release Valves

.1 All valves to be coated internally and externally with an ANSI/NSF61 approved fusion bonded epoxy suitable for potable drinking water. All valves to be color coded blue. Related nuts and bolts required on valve body shall be stainless steel 316. Valves shall be sized in accordance with the

drawings and suitable for potable water application.

.1 Body Material: Ductile Iron to ASTM A536
.2 Grade 65-45-12;
.3 Float Material: Stainless Steel;
.4 Seat: Buna-N to ASTM D20000-BG;
.5 Air release valve shall be complete with PVC Schedule 40 discharge pipe to be piped to floor drain;
.6 Air release valve shall be installed as per Manufacturer’s recommendations;
.7 Acceptable Product: Cla-Val Model 34 or approved equal.

PART 3 - EXECUTION

3.1 Preparation

.1 Valve and mating flange preparation.
.1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.
.2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.
.3 Install butterfly valves with disc in almost closed position.
.4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 Installation of Valves

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Handle valve with care so as to prevent damage to disc and seat faces.

.5 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

3.3 Installation of Strainers

.1 Install Strainers as shown on drawings and as per manufacturer’s recommendations.

3.4 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Clean installed products in accordance to manufacturer's recommendation.

END

PART 1 - GENERAL

1.1 Related Requirements

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 22 05 17 - Pipe Welding.

.3 Section 23 05 29 – Hangers and Supports for Piping.

.4 Section 23 05 53.01 – Mechanical Identification.

1.2 References

.1 American Iron and Steel Institute (AISI)

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ANSI/ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
- .2 ASME B31.1-07, Power Piping.

.3 ASTM International
- .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .2 ASTM A193/A193M-08b, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
- .3 ASTM A194/A194M-08b, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
- .4 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.4 CSA International
- .1 CSA B51-09, Boiler, Pressure Vessel and Pressure Piping Code.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 Action and

Informational Submittals

.1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 Closeout Submittals

.1 Provide Project Record Documents in accordance with Section 01 78 00 - Closeout Submittals supplemented with:
.1 Information relating to elevations, inverts and location of piping.
.2 Valve data.
.3 Details of permanent instrumentation.
.4 Drainage provisions at low points.

1.5 Maintenance Material Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 Quality Assurance

.1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.7 Delivery, Storage and Handling

.1 Delivery and Acceptance Requirements:
.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Packaging Waste Management: remove for reuse and return of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 Pipe and Fittings for Sanitary Lift Station

.1 Piping and fittings:

.1 All buried pipes shall be Schedule 40 type 304L stainless steel unless specified otherwise.
.2 All buried stainless steel fittings shall be welded.
.3 Piping shall be supported as shown on the drawings.
.4 Piping shall be Schedule 80 PVC to ASTM D1785, NSF14 and/or CSA B137.0/B137.3 with chemical weld fittings.
.5 Schedule 80 socket fittings shall conform to ASTM D2467 and Schedule 80 threaded fittings shall conform to ASTM D2464. All fittings must be third party certified to NSF 14.
.6 All Schedule 80 fabricated fittings shall be reinforced with fiberglass reinforced plastic (FRP).
.7 All pipe, fittings and valves shall be compatible and produced by one manufacturer; as supplied by IPEX.
.8 Piping shall be supported as shown on the drawings

.2 Gaskets:
.1 Will be 1.6 mm thick, rubber and flat ring.

.3 Nuts and Bolts:
.1 All nuts and bolts shall be heavy head machine bolts and nuts, stainless steel Type 316, for inside the building. Use a suitable thread compound to prevent galling when tightening the bolts. All nuts shall be re-tightened after initial installation to ensure that they have not become loose.

2.2 Valves

.1 Refer to Section 23 05 23 – Valves.

.2 Refer to Section 23 05 23.03 – Butterfly Valves.

2.3 Pressure Gauges

.1 Refer to Section 23 05 19 – Meters and Gauges for Water Piping.

2.5 Fabrication

.1 Do work in accordance with ASME B31.1.

.2 Joints:

.1 Accessible locations: screwed, flanged or welded to match piping specification.
.2 Elsewhere: welded throughout, except at flanged components.
.3 Grooved joints on applicable systems in lieu of welded, flanged, or screwed joints and components.

.3 Branch connections:
.1 Use butt or socket-weld fittings.
.2 Mains NPS 2-1/2 and smaller: use weldolets, threadolets, or 2 Mpa half couplings as reinforcements.
.3 Mains NPS 3 and larger: welded branch connections can be used.
.4 In grooved systems: tees and reducing tees can be used.

2.6 Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be seal wit Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 Preparation

.1 Lay out work in accordance with lines and grades as indicated.

.2 Verify lines, levels, dimensions as indicated against established benchmarks. Report discrepancies to Department Representative and obtain written instruction.

.3 When required by Engineer, provide drawings showing relative locations of various services.

3.2 Welding

.1 Perform welding in accordance with Section 23 05 17 - Pipe Welding supplemented as specified herein.

.2 Notwithstanding the requirements of referenced section, the following shall apply:

.1 Welding to be in accordance with ASME B31.1.
.2 Welding to be executed by certified pipe welders.
.3 Pipe fitting to be executed by certified pipe fitters.

3.3 Grooved Joints

.1 Install grooved joints in accordance with manufacturer's latest published installation instructions.

.2 Ensure grooved ends are: clean, free from indentations, projections, and roll marks in the area from pipe end to groove.

.3 Select gaskets with elastomer grade suitable for service and produced by coupling manufacturer.

3.4 Installation

.1 Installation to be performed by certified pipe fitters.

.2 Install pipework as shown on drawings.

.3 Clearances:
.1 Maintain clearance around systems, equipment and components and between pipes and structures for O M to manufacturer's recommendations.

.4 Flanges: use suitable graphite lubricant on bolts and nuts. Tighten bolts evenly with torque wrench.

.5 Butterfly valves: install between weld-neck flanges.

.6 Branch take-offs:
.1 Use welding tees.
.2 Where reducing tees of proper size are unavailable, use available tees with reducers. Tees with increasers not acceptable.

.7 Cap open ends of piping during installation. Remove foreign material from inside piping.

.8 Grade nominally horizontal piping at 0.4% slope to high point for air removal.

.9 Flanges: tighten bolts evenly with torque wrench.

.10 Revisions to location of piping require written approval of Department Representative.

.11 Connections to equipment:
.1 Use flanged valves for isolation and ease of maintenance and assembly.

Pipe Supports

.1 In accordance with Section 22 05 29 – Hangers and Supports for HAVC, Piping and Equipment, supplemented by herein.

.2 Install to manufacturer’s recommendations.

3.6 Valves

.1 Install as shown on drawings.

.2 Install in accordance with manufacturer's recommendations.

.3 Install isolation valves at branch take-offs, at pieces of equipment and elsewhere as indicated.

.4 Install butterfly valves, where specified, between weld neck flanges to ensure full compression in liner.

.5 Install at accessible locations.

.6 Valves to be accessible for maintenance without removing adjacent piping.

Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe penetrations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer’s recommendations.

3.7 Field Quality Control .1 Inspections:

.1 Leave joints in piping systems uncovered until tests are completed and system inspected as directed by Department Representative.

.2 Department Representative to inspect new piping prior to hydrostatic pressure tests for compliance with approved drawings and specifications.

.3 Obtain from Department Representative requirements for inspection and testing of system modifications, design changes and repairs performed in-house.

.4 Pay costs for inspections.

3.8 Hydrostatic Pressure Test: .1 Refer to Section 33 11 16 – Site Water Utility Distribution Piping.

3.9 Flushing and Cleaning .1 Refer to Section 33 11 16 – Site Water Utility Distribution Piping.

3.10 Commissioning .1 Instrumentation: verify accuracy of pressure gauges by comparison with calibrated test instruments.

.2 Full scale tests: upon completion, conduct full scale tests at maximum design flow rates, operating temperatures and pressures for continuous consecutive period of 2 hours to demonstrate compliance with design requirements.

Identification .1 In accordance with Section 20 05 53.01 – Mechanical Identification, supplemented as specified herein.

.2 In addition, identify piping at building entries.

3.12 Demonstration .1 Operate at design temperatures, pressures, flow rates for consecutive period of 2 hours to demonstrate compliance with design criteria and design intents.

.2 Demonstrations also to show completeness of O M personnel training.

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 01 33 00 - Submittal Procedures.

1.2 References

.1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
- .1 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
- .2 ANSI/AWWA C504-10, Rubber-Seated Butterfly Valves.
- .3 ANSI/AWWA C508-09, Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.

.2 ASTM International
- .1 ASTM C 478M-11, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.

.3 CSA International
- .1 CAN/CSA-A257 Series-09, Standards for Concrete Pipe.
- .2 CSA B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for sewage lift station for incorporation into manual.

.3 Include information as follows:
- .1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
- .2 Interconnections with numbers and wire sizes.
- .3 Pump characteristic curves.
- .4 Detailed operation and maintenance instructions.
- .5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect packaged sewer lift from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 Scope of Work

.1 The work to be performed for the Package Lift Station shall consist of the supply and installation, including all equipment and

material all as outlined on the drawings, or as described in the specification, or as directed by the Department Representative. This shall include fibreglass wet well, submersible pumps, valves, piping and supports, fittings and joint restraint, connections to force main, float switches, electrical service with new breaker and all other work and materials required for a complete installation, including controls.

PART 2 - PRODUCTS

2.1 General

.1 Pumps shall be of the submersible grinder type, specifically designed for the handling of raw, unscreened, sanitary domestic sewage.

.2 The pumping unit shall be a duplex station complete with control panel and interconnecting piping.

.3 The wet well chamber shall be a prefabricated fiberglass basin single piece, complete with anti-floation flanges, fiberglass cover, vent pipe, one (1) 2" side discharge and two (2) 4" inlet hubs. Guide rails, hardware, lifting chains, plumbing, couplings, isolation valves and check valve shall be complete and considered incidental to the work.

.4 Acceptable pump suppliers must have a Newfoundland service representative fully capable and experienced in the operation and maintenance of their product. This representative must be capable of troubleshooting and repairing mechanical and pump controller problems. This requirement will be considered in the evaluation of alternative products. Suppliers shall demonstrate this ability in requesting for the equipment approval.

.5 Lift station (including; pump, controls, piping, etc.) should be supplied as a full lift station package from one supplier.

2.2 Performance

.1 Each pump must have the necessary characteristics and be properly selected to perform under these operating conditions:

.2 Capacity 1.8L/s (28 USgpm), Geodetic Head 23.4 m (77 ft), Total Dynamic Head 28.8 m (95.0 ft), Max Pump RPM 3450, Motor 2HP (Electric), Electrical Characteristics 208V, 3 PH, 60 Hz Pump Type Submersible Grinder Pumps.

2.3 Pump and Design Approvals

.1 The pump(s) shall be automatically and firmly connected to the discharge connection, guided by one or two guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact or with a gasket. No portion of the pump shall bear directly on the wet well floor.

.2 The pump shall be vertical rotor, motor driven, solids handling pump. Pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service.

.3 The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 - 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding.

.4 This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump.

.5 The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter discharge piping.

.6 The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-145, rated for submersible pumping for sewage applications. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable. The pump/motor unit is to be approved by CSA for service in Class I, Zone 1, Groups C or D hazardous locations.

.7 It will be the responsibility of the Manufacturer / Supplier to confirm that the proposed selection is the most suitable for the application and will be verified during shop drawing review.

2.4 Construction

.1 The pump must be specifically designed for this application, and certification is to be submitted with shop drawings for review and approval.

.2 The duplex pumping unit shall be mounted on a rail system that permits the removal of both pumps independently through the hatch in the wet well cover. This system shall come as part of the pump supply package. The rail system shall be sufficiently rigid to operate smoothly through the depth of the wet well.

2.5 Motors

.1 The motor shall be a maximum 2 HP, 3450 RPM, 208 Volt 60 Hertz, 3 Phase, ball bearing, oil filled, Class F insulated NEMA B design, rated for continuous duty. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. The wet portion of the motor armature must be stainless steel.

.2 Pump/motor assembly shall have CSA approval as one unit per CSA Standard C22.2-145. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. Motors shall not be overloaded at design pump operating conditions or at any head in pump operating range as specified.

2.6 Piping and Fittings

.1 Piping and fittings in the wet well will be PVC Schedule 80 or approved equal.

.2 Valves shall be as per manufacturers recommendation.

2.7 Lift Station Control Panel

.1 Pump Control shall have OFF, LEAD ON, LAG ON and Alarm levels.

.2 Each grinder pump station shall include a NEMA 4X, Intrinsically safe, UL-listed control/alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. NEMA 4X polyester enclosure shall be pre-mounted inside a weather proof stainless steel enclose. Size of the stainless steel enclosure shall sufficient to allow for proper operation and maintenance of the equipment.

.3 The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp, single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

.4 The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

.1 When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.

.2 The audible alarm may be silenced by means of the externally mounted, push-to-silence button.

.3 Visual alarm remains illuminated until the sewage level in the wet-well drops below the “off” setting of the alarm pressure switch.

.5 Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 85 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch.

.6 Run-time/Hour Meter - A run-time or hour meter to display the total run-time or operation time per pump shall be provided.

2.8 Acceptable Products

.1 Acceptable Grinder Pump Lift Station Package shall be a Duplex Liberty Pumps XLSGX200 Grinder pumps package c/w 1200mm dia. Liberty Pumps EPS

fibreglass Duplex Grinder Pump Station Wet Well or approved equal. Control Panel shall be Liberty Pumps ISD-Series model ISD34=4-511-5 or approved equal.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewage lift installation in accordance with manufacturer's written instructions.

3.2 Excavation, Backfilling and Compaction

.1 Excavate, backfill and compact in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and as indicated.

3.3 Concrete

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.4 Equipment Installation

.1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.5 Field Quality Control

.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Department Representative.

.2 Test in presence of Department Representative and representative from equipment supplier.

.3 Provide labour and ancillary equipment necessary to fulfill tests.

.4 Test to demonstrate that:
- .1 Pumps and equipment run free from heating, or vibration.
- .2 Operation meets requirements of these specifications.
- .3 Pumps and pumping are free and clear of debris and obstructions.

.5 Replace equipment found defective.
.1 Repeat test until equipment is accepted by Department Representative.

3.6 Demonstration

.1 Operating Personnel Training
.1 Provide on-site training by qualified personnel for designated operating personnel prior to final commissioning.
.1 Schedule and deliver training in accordance with training plan approved in writing by Department Representative.
.2 Include training for three (3) designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
.3 Include safety precaution procedures for systems.

3.7 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 References

.1 Definitions:

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

.2 Reference Standards:

.1 Canadian Standards Association (CSA)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23nd Edition), Safety Standard for Electrical Installations.

.2 CAN/CSA-C22.3 No.1-10, Overhead Systems.

.3 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.4 CSA C282.09, Emergency Power Supply for Buildings.

.5 CAN/ULC – S524-06, Installation of Fire Alarm Systems.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit WHMIS MSDS in accordance with Construction and Hazardous Materials Section.

.3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.

.1 Electrical distribution system in main electrical room.

.2 Electrical power generation and distribution systems in power plant rooms.

.4 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 Submit required number of copies of 600 x 600 mm minimum size drawings to authority having jurisdiction.

.5 If changes are required, notify Departmental Representative of these changes before they are made.

.5 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment or material is not available, submit such equipment and material to authority having jurisdiction for approval by a certified agency of Standard Council of Canada (SCC) before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with

General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

.3 In addition to technical data the Electrical Contractor shall also include:

.1 Names, addresses and phone numbers of local supplier for items included in the maintenance manual

.2 Copy of reviewed shop drawings.

.3 Copy of Electrical Specifications.

.4 Names, addresses and phone numbers of Electrical Sub-contractors.

.5 Inspection certificates and verification reports.

.6 Letter or certificate of warranty.

1.4 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material Delivery Schedule: Provide consultant with schedule within 2 weeks after award of contract for all long delivery items.

.3 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.4 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from damage to finish or material.

.3 Replace defective or damaged materials with new.

.5 Develop Construction Waste Management Plan related to Work of this section.

.6 Packaging Waste Management: remove for recycling of pallets, crates, or packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 Substitutions

.1 All material not meeting the specifications above shall not be allowed on the project site.

.2 Substitutions affecting the design will not be permitted. Additional costs to any other trade as a result of a change or substitution by this contractor shall the responsibility of this contractor.

.3 The listing of a manufacturer as acceptable does not imply acceptance of all products of that manufacturer and only products meeting the specifications will be accepted.

1.6 Scope of Work

.1 The Electrical Contractor shall furnish all labour, material, tools, appliances and equipment to entirely complete and provide the operation of the electrical systems.

.2 The overall intention is to provide a functioning complete electrical installation in all aspects, and all items reasonably inferable as called for by the drawings and specifications, and by normally accepted good practice, notwithstanding that every item necessarily required may not be particularly mentioned. This Contractor shall fulfill his obligation and not take advantage of any unintentional errors or omissions, should any exist, to the detriment of the Departmental Representative’s interest. The work shall include but not be limited to:

.1 Branch circuit wiring

.2 Removal of existing wiring, devices as

required.

.3 Installation of lightning protection.

.4 Installation of exterior lighting.

.5 Coordination with other trades. See civil drawings.

1.7 Electrical Drawings

.1 The electrical drawings which constitute an integral part of this contract shall serve as working drawings. They indicate the general layout of the complete electrical system arrangements of feeders, circuits, outlets, switches, controls, panelboards, service equipment, communications, fire alarm systems, underground duct banks, overhead pole lines, power center, etc.

.2 Field verification of scale dimensions on drawings is directed since actual locations, distances, and levels will be governed by the field conditions.

.3 All discrepancies related to the electrical work shall be promptly brought to the attention of the Engineer for clarification.

1.8 Existing Condition and Examination of Drawings

.1 The Electrical Contractor shall become completely familiar with the drawings and specifications, as well as construction methods of other trades related to the work to avoid possible interferences on the project. Should drastic changes be necessary to resolve such conflicts, this Contractor shall notify the Engineer and secure written approval and agreement on the necessary adjustments before the installation is started.

.2 Before submitting the tender, this Contractor shall visit the site and become familiar with site conditions, availability of storage space and all other factors that might influence the tender submittal.

.3 The contractor shall determine all working conditions and rigidly comply. Conditions that require special consideration include but not limited to: Dust, Noise, Vibration, Water,

Working hours, Continuity of power, Access to area of work, Physical protection of Departmental Representative's facility and equipment.

.4 No extras will be allowed due to failure to account for site conditions or working conditions.

.5 The exact rough in dimensions and connection points shall be determined from shop drawings and on site measurements.

1.9 Discrepancies

.1 Bidders in preparing their tender, finding any errors, omission, or discrepancies in the drawings, specifications or other documents, or having any doubt in the intent or meaning of any part thereof, shall immediately notify the Engineer, who will send written instructions or clarification to all bidders. Where such discrepancies exist and it is evident that this Contractor could not have properly tendered without clarifications and where such clarification was not requested, not extra to the contract will be considered in order to have the installation properly made. The Departmental Representative and Engineer will not be responsible for oral instruction.

PART 2 - PRODUCTS

2.1 Design Requirements

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.3 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.4 Language operating requirements: provide identification nameplates and labels for

control items in English and French.

.5 Use one nameplate or label for both languages.

2.2 Materials and Equipment

.1 Provide material equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, for approval by a certified agency of Standard Council of Canada (SCC) before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 Electric Motors, Equipment and Controls

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring conduit: in accordance with Section 26 05 34 – Conduit, Conduit Fastenings and Conduit Fittings. All wiring and connections below 50 V which are related to control systems specified in mechanical sections or as shown on mechanical drawings shall not be the responsibility of this contractor unless otherwise noted.

2.4 Warning Signs

.1 Warning Signs: in accordance with requirements of authority having jurisdiction inspection authorities Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 Wiring Terminations

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 Equipment Identification

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3 mm matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with rivets.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings, numbered on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 Conduit and Cable Identification

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
Controls	Gray	

2.9 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC-2Y-1.

PART 3 EXECUTION

3.1 Installation

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.2 Nameplates and

.1 Ensure manufacturer's nameplates, CSA labels

Labels

and identification nameplates are visible and legible after equipment is installed.

3.3 Conduit and Cable Installation

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 Location of Outlets

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.5 Mounting Heights

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Wall receptacles:

.1 General: 400 mm.

.2 Above top of counters or counter splash backs: 175 mm.

.3 In mechanical rooms: 1400 mm.

.2 Panelboards: as required by Code or as indicated.

3.6 Co-ordination of Protective Devices

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 Co-ordination with Others

.1 Electrical contractor shall co-ordinate the installation of equipment to minimize inconvenience to Departmental Representative and other sub-contractors.

.2 Work by other contractors will be done concurrently with work in this contract. This contractor shall schedule and arrange the work and store materials in co-operation so as to avoid interference with others.

3.8 Cutting, Patching and Painting

.1 The contractor shall be responsible for all cutting required to complete the work shown on the drawing and described herein.

.2 All holes through concrete or masonry shall be made by core drilling. Care must be taken to contain dust and debris.

.3 The contractor shall neatly patch all surfaces cut or damaged as a result of this contract.

.1 All patching shall be of matching material and carried out by tradesmen trained and skilled in the work to be done.

.4 The contractor shall re-paint all surfaces as required. All painting shall be carried out by skilled tradesmen.

.5 All patching, painting and sealing shall be to the satisfaction of the Departmental Representative and Engineer.

3.9 Field Quality Control

.1 Qualifications: Electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction and as per the conditions of Provincial Act respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician to perform specific task.

.2 Permitted activites: determined based on the training level attained and demonstration of ability to perform specific duties

.2 Health and Safety Requirements: Complete construction in accordance with occupational health and safety regulations.

.3 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.4 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Circuits originating from branch

distribution panels.

.2 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.5 Carry out tests in presence of Departmental Representative.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.10 System Startup

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with

aspects of its care and operation.

3.11 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.12 Closeout Submittals

.1 Refer to Section 01 78 00 - Closeout Submittals.

.2 Two sets of white prints shall be maintained for the exclusive purpose of recording deviations from that shown on the contract drawings. One set shall be kept up to date at all times. At the completion of the project the information shall be transferred to the second set of drawings and to a set of reproducible CAD drawings. Both sets shall be turned over to the Departmental Representative.

3.13 Guarantee

.1 Guarantee material and workmanship to be free from defect for a period of one (1) year or longer where specified otherwise, after issuing of the certificate of substantial completion.

.2 Make good, at the Departmental Representative’s convenience, all defects covered by this guarantee without additional cost to the Departmental Representative.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for recycle of pallets crates padding packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 8 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE RWU90 XLPE, or Jacketed.

2.2 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.

.3 Size and shielding as indicated and in accordance with manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform megger and impedance tests using method appropriate to site conditions and to

approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in conduit as per Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.3 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.4 Conductor length for parallel feeders to be identical.

.5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.6 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.7 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.8 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with details indicated on drawings.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit or underground ducts.

.2 Ground control cable shield.

END

PART 1 – GENERAL

1.1 Related Requirement

.1 Section 26 05 00 Common Work Results for Electrical

1.2 References

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
   .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

.2 CSA International
   .1 CSA Z32-09, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
   .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00. Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 with manufacturer's instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
   .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect grounding equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan.

PART 2 – PRODUCTS

2.1 Equipment

.1 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.

.2 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, copper conductors, size as indicated.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
.1 Grounding and bonding bushings.
.2 Thermite welded type conductor connectors.
.3 Bonding jumpers, straps.
.4 Pressure wire connectors.

2.2 Air Terminals

.1 lightning protection system shall be installed by an electrician with certification for installation of lightning systems in accordance with local regulations.
.2 3/8” x 10” Solid Copper.
.3 Bare Copper.
.4 Nickel plated tip with adapter.
.5 Acceptable material: Thompson Lighting Protection or approved equal

PART 3 – EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.
   .1 Visually inspect substrate in presence of Departmental Representative.
   .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
   .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 Installation General

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Run ground wire in conduit where indicated.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermite process connections.

.5 Use mechanical connectors for grounding

connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solder less lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end and load end.

.13 Ground secondary service pedestals

3.3 Electrodes

.1 Bond separate, multiple electrodes together.

.2 Use size copper conductors for connections to electrodes, sized as indicated.

3.4 Equipment Grounding

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.5 Permafrost

.1 Drive three -19 mm diameter x 3 m copper clad ground rods at least 3 m apart in original undisturbed ground. If rods will not penetrate permafrost, drive at angle not more

than 60 degrees from vertical, and in same direction. Rods must be driven, not trenched.

.2 Install electrode interconnections where metal parts, circuits or grounding conductors and/or electrodes are in proximity to lightning rod conductors.

3.6 Field Quality Control

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.7 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 References

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

1.4 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Junction and Pull Boxes

.1 Construction: welded steel enclosure.

.2 Covers Surface Mounted: screw-on flat covers.

PART 3 EXECUTION

3.1 Junction, Pull Boxes and

.1 Install pull boxes in inconspicuous but accessible locations.

Installation

.2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 Identification

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 References

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

1.4 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:
  .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 Outlet and Conduit Boxes - General

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Fittings - General

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 Installation

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 References

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 Waste Management and Disposal

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.5 Conduits

.1 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.2 Liquid Tight Flexible Conduit, CSA C22.2

1.6 Conduit Fastenings

.1 One hole steel straps to secure surface conduits 50 mm and smaller.
  .1 Two hole steel straps for conduits larger than 50 mm.
  .2 Beam clamps to secure conduits to exposed steel work.
  .3 Channel type supports for two or more conduits at 1.5 m on centre.
  .4 Threaded rods, 6 mm diameter, to support suspended channels.

1.7 Conduit Fittings

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
  .1 Rain tight type only.
  .2 Set-screw type are not permitted.

1.8 Expansion Fittings for Rigid Conduit

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

PART 2 - PRODUCTS

2.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

2.2 Installation

.1 All underground conduit shall be RIGID PVC.

.2 Minimum conduit size for lighting and power circuits: 19 mm.

.3 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.4 Liquid Tight Flex Metal.

.5 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.6 Dry conduits out before installing wire.

.7 Conduit sealing shall be done in accordance with CEC section 6 and 22.

.8 Sufficient drainage to prevent water and moisture build-up.

.9 Installed in such a way to prevent water from entering building.

2.3 Surface Conduits

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

2.4 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Section 26 05 00 - Common Work Results for Electrical.

1.2 References

.1 CSA International

.1 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2015, FSC Principle and Criteria for Forest Stewardship.

.3 Insulated Cable Engineers Association, Inc. (ICEA)

.4 Sustainable Forestry Initiative (SFI)

.1 SFI-2015-2019 Sustainable Forest Initiative Standards and Rules.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Cable Protection

.1 38 x 140 mm planks pressure treated with clear or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 Markers

.1 Concrete type cable markers: 600 x 600 x 100 mm with words: PRI Cable, SEC Cable, or impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

2.3 Warning Tape

.1 Buried electrical cable warning tape over full length route of cable (raceway).

PART 3 EXECUTION

3.1 Direct Burial of Cables

.1 After sand bed in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.

.1 Do not pull cable into trench.

.2 Include offsets for thermal action and minor earth movements.

.1 Offset cables 150 mm minimum for each 60 m run, maintaining minimum cable

separation and bending radius requirements.

.3 Make termination and splice only as indicated leaving 0.6 m minimum of surplus cable in each direction.

.1 Make splices and terminations in accordance with manufacturer's written recommendations using approved splicing kits.

.4 Underground cable splices not acceptable.

.5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.6 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

.2 Maintain 300 mm minimum horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

.6 Install treated planks on lower cables 0.6 m minimum in each direction at crossings.

.7 After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping 38 x 140 pressure treated planks as indicated to cover

length of run.

3.2 Cable Installation in Ducts

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.3 Markers

.1 Mark cable every 150 m along duct runs and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.4 Field Quality Control

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with on each phase conductor in accordance with manufacturer’s recommendation.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct Hipot testing in accordance with manufacturer's recommendations.

.4 Leakage Current Testing:

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove

surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 Protection

.1 Repair damage to adjacent materials caused by cables installation.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 26 05 00 Common Work Results for Electrical.

1.2 References

.1 CSA International

.1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

.4 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Panelboards

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 208 V panelboards: bus and breakers rated as indicated(symmetrical) interrupting capacity.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of same ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked grey enamel.

.11 Isolated ground bus.

.12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 Breakers

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

2.3 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

.5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

PART 3 EXECUTION

3.1 Installation

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Where panels of different systems (i.e.

Standard and Vital Power) supply a common patient care area, ground busses in panels to be interconnect with a minimum #6 AWG ground conductor.

3.2 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 26 05 00 Common Work Results for Electrical.

1.2 References

.1 CSA International

.1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Switches

.1 15 A, 125 V, single pole switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads heating loads.

.4 Switches of one manufacturer throughout project.

2.2 Receptacles

.1 Duplex receptacles, CSA type 5-20 R, 125 V, 20 A, U ground, to: CSA C22.2 No.42 with following features:

.1 Ivory urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout

project.

2.3 Cover Plates

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

2.4 Source Quality Control

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 Installation

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 Cleaning

.1 Progress Cleaning: clean in accordance with

Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 Protection

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 26 24 02 - Service Entrance Board.

1.2 References

.1 CSA International

.1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 -

Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Breakers General

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips as indicated.

.6 Circuit breakers to have minimum 10 kA symmetrical rms interrupting capacity rating.

2.2 Thermal Magnetic Breakers Design A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 Magnetic Breakers Design B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 Optional Features

.1 Include:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Motor-operated mechanism c/w time delay

unit.

.4 Under-voltage release.

.5 On-off locking device.

.6 Handle mechanism.

2.5 Enclosure

.1 Locate and mount in enclosure as indicated.

PART 3 EXECUTION

3.1 Installation

.1 Install circuit breakers as indicated.

3.2 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 – GENERAL

1.1 Related Requirements

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 References

.1 CSA International
  .1 CAN/CSA-B72-M87(R2008), Installation Code for Lightning Protection Systems.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
  .1 Indicate materials and methods of attachment of conductors to air terminals and electrodes.

1.4 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
  .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .2 Store and protect lighting protection from nicks, scratches, and blemishes.
  .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section.

.5 Packaging Waste Management: remove , packaging materials as specified in Construction

Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal .

PART 2 - PRODUCTS

2.1 Materials

.1 Air terminals: copper , solid rod.

.2 Conductor: copper , smooth weave.

.3 Fastenings and attachment straps: copper.

.4 With down runs and cable clamps as indicated to form a complete sky-cone system.

2.2 Description

.1 System to consist of metallic air terminals, lightning conductors connecting air terminals to ground and interconnected ground electrodes, and/or ground cables.

2.3 Regulatory Requirements

.1 System subject to: approval by authority having jurisdiction.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection installation in accordance with manufacturer's written instructions.
  .1 Visually inspect substrate in presence of Consultant.
  .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 Installation

.1 Install lightning protection to CAN/CSA-B72.

.2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.

.3 Submit certificate of installation to Consultant.

3.3 Inspection

.1 Obtain inspection certificate from Consultant for discharge conductor passing through any fire supporting membrane.

3.4 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal 01 35 21 - ts.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by lightning protection installation.

END

PART 1 – GENERAL

1.1 Related Requirement

.1 Section 26 05 00 Common Work Results for Electrical

1.2 References

.1 American National Standards Institute (ANSI)

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
- .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-
- .2 Voltage AC Power Circuits.

.3 ASTM International Inc.
- .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

.7 Illuminating Engineers Society (IES) standards

.8 Design Lighting Consortium (DLC) guidelines

1.3 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval Departmental Representative.

.3 Quality assurance submittals: provide following in accordance with Section 01 30 00.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and testing.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Standard General Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for return of pallets, crates, padding, packaging materials in accordance with Section 01 74 21 - Construction Waste Management and Disposal.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

.6 Disposal of old PCB filled ballasts

PART 2 – PRODUCTS

2.1 LED Driver

.1 Rating: voltage as indicated 60 Hz, for use with LED fixtures.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95 % with 95% of rated lamp lumens.

.4 Type: solid state.

.5 Input voltage range: plus or minus 10% of nominal.

.6 Minimum starting temperature: minus 30 degrees Celsius at 90% line voltage.

.7 Mounting: integral with luminaire.

2.2 Finishes

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation

2.3 Optical Control Devices

.1 As indicated in luminaire schedule.

2.4 Luminaires

.1 Luminaire A

.1 Exterior LED wall pack, downlight only to meet full cut-off guidelines. Mount as per drawing.
.2 Luminaire shall be 50W, 6000 lumens, 2700K, type T4M distribution.
.3 Sealed for wet location listed and IP65 rated, with die cast aluminum housing. Durable TGIC thermoset powder coat finish in standard colors.
.4 Acceptable Manufacturers:
-Lithonia WST-LED-P3-27K-VF-MVOLT-PE,

PART 3 – EXECUTION

3.1 Installation

.1 Locate and install luminaires as indicated.

.2 Provide dedicated support bracket to mount to tank.
.1 Coordinate with all supports and fasteners with seismic requirements.

3.2 Wiring

.1 Connect luminaires to lighting circuits:
.1 Install flexible or rigid conduit for luminaires as indicated.

3.5 Cleaning

.1 Clean in accordance with Section 01 74 11.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction Waste Management and Disposal.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Section 32 11 23 – Aggregate Base Courses

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles or Flat and Elongated Particles in Coarse Aggregate.

1.3 Source Approval

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling four (4) weeks minimum before starting production. The Contractor or his representative is to be present during sampling.

.2 Aggregate sources must be free of invasive species and capable of producing clean material to the satisfaction of the Departmental Representative.

.3 If, in opinion of Departmental Representative, aggregate from the proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that aggregate from source in question can be processed to meet specified requirements.

.4 Should a change of aggregate source be proposed during work, advise Departmental Representative one (1) week in advance of proposed change to allow sampling and testing.

.5 Acceptance of an aggregate at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.4 Sampling

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Allow continual sampling by Departmental Representative during production.

.3 Provide Departmental Representative with access to source and processed material for sampling.

.4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 - PRODUCTS

2.1 Materials

.1 Aggregate quality: sound, hard, durable aggregate free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in a deleterious manner for the use intended.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
- .1 Greatest dimension to exceed three times least dimension.

.3 Fine aggregate satisfying requirements of applicable section to be one, or a blend of following:
- .1 Natural sand.
- .2 Manufactured sand.
- .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
- .1 Crushed rock.
- .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- .3 Light weight aggregate, including slag and expanded shale.

.5 RAP (Re-used Asphalt Product) to be removed from the existing RAP roadways in the campground, stockpiled, processed, and

replaced in the same location following the installation of underground utilities.

PART 3 – EXECUTION

3.1 Equipment

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris or soil from a previous job site will not be permitted to enter the project site.

3.2 Stripping of Topsoil

.1 Commence topsoil stripping of areas as indicated by the Guidelines and as directed by the Departmental Representative.

.2 Avoid mixing topsoil with subsoil.

.3 Stockpile in locations as indicated by the Guidelines. Stockpile height not to exceed 2m.

.4 Refer also to Section 31 14 13 - Soil Stripping and Stockpiling.

3.3 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.4 Stockpiling

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into

work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:
- .1 Maximum 1.5 m for coarse aggregate and base coarse aggregate.
- .2 Maximum 1.5 m for fine aggregate and sub-base aggregate.
- .3 Maximum 1.5 m for other aggregate.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.5 Aggregate Stockpile Cleanup

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

3.6 Source Abandonment

.1 For temporary or permanent abandonment of aggregate source, rehabilitate source to condition meeting requirements of the Guidelines.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 31 23 33 - Excavating, Trenching, and Backfilling.

.2 Section 31 14 13 - Soil Stripping and Stockpiling.

.3 Section 01 35 43 - Environmental Procedures.

1.2 References

.1 Environment Canada.

1.3 Definitions

.1 Clearing consists of cutting off trees (manual cutting only, no machinery clearing permitted) and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris off site.

.5 Grubbing consists of excavation and disposal of stumps, roots, and other embedded or partially embedded organic matter including boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.4 Quality Assurance

.1 Do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.5 Storage and Protection

.1 Prevent damage to adjacent properties, fencing, root systems of trees, natural features, bench marks, survey markers and monuments, existing pavement, landscaping, natural features, utility lines, buildings, site appurtenances, and water courses which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

PART 2 – PRODUCTS

2.1 Materials

.1 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials. Must be approved for use by the Departmental Representative for use on this project.

PART 3 – EXECUTION

3.1 Equipment

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris or soil from a previous job site will not be permitted to enter the project site.

3.2 Preparation

.1 Inspect site and verify with Departmental Representative items designated to remain.

.2 Contractor to ensure that ALL equipment that is brought onsite is thoroughly washed prior to arrival to ensure that no seeds, soil or other possible contaminants are transferred to this site.

.3 Locate and protect existing structures and features within the work area.

.4 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.5 Notify all applicable utility authorities before starting clearing and grubbing.

.6 Obtain all necessary permits prior to start of any clearing and grubbing operations.

.7 Keep roads and walks free of dirt and debris.

3.3 Clearing

.1 Clearing includes felling, trimming, and cutting of trees by manual methods only (chain saws) into sections and satisfactory disposal of trees and other vegetation designated for removal occurring within cleared areas.

.2 Clear as indicated by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Bulldozing of trees is not permitted.

.4 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.

.5 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.4 Isolated Trees

.1 Cut off isolated trees as indicated or as directed by Departmental Representative at height of more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

3.5 Grubbing

.1 Grubbing is not required for area under temporary roadway.

.2 Remove and dispose of roots larger than 75 mm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.3 Grub out stumps and roots to not less than 200 mm below ground surface.

.4 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.5 Fill depressions made by grubbing with

suitable material and to make new surface conform with existing adjacent surface of ground.

3.6 Removal and Disposal

.1 Stockpile grubbed materials and topsoil for re-use in off road areas, with the exception of roots and stumps, on-site within the Right-of-Ways or the identified lay down areas in agreement with the Departmental Representative.

.2 Cut timber greater than 125 mm diameter and stockpile. Stockpiled timber becomes property of Contractor.

.3 Remove diseased trees identified by Departmental Representative and dispose of this material in accordance with all applicable municipal, provincial and federal regulations.

3.7 Finished Surface

.1 Leave ground surface in condition suitable for subsequent stripping of remaining topsoil, to approval of Departmental Representative.

3.8 Cleaning

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 01 35 43 Environmental Procedures.

.2 Section 31 23 33 - Excavating, Trenching and Backfilling.

1.2 References

.1 Environment Canada.

.2 When conflicts occur between EPA and Environment Canada, the more stringent requirement shall apply.

PART 2 – PRODUCTS

.1 (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 Stripping of Topsoil

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris, seeds, or soil from a previous job site will not be permitted to enter the project site.

.2 Ensure that procedures are conducted in accordance with applicable federal, provincial and municipal requirements.

.3 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.4 Handle topsoil only when it is dry and warm.

.5 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.

.6 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.

.7 Strip topsoil to depths as indicated and to satisfaction of Departmental Representative.

.1 Avoid mixing topsoil with subsoil.

.8 Stockpile topsoil in berms in the Right-of-Ways or in the provided lay down locations approved by Departmental Representative.
  .1 Stockpile height not to exceed 2 m.

.9 Dispose of unused topsoil as indicated and in accordance with all applicable federal, municipal and provincial regulations.

.10 Protect stockpiles from contamination and compaction.

.11 Cover topsoil that has been piled for long term storage with anchored waterproof and insulated tarps, as required to resist wind, water and winter conditions. Place silt fence around the stockpiles to filter sediment entering or exiting the pile.

3.2 Preparation of Grade

.1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.
  .1 Grade area only when soil is dry to lessen soil compaction.
  .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.3 Placing of Topsoil

.1 Place previously stripped topsoil only after Departmental Representative has accepted subgrade.

.2 Spread topsoil during dry conditions in uniform layers not exceeding 100 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

3.4 Cleaning

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of

performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 31 23 33 - Excavating, Trenching and Backfilling.

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D 698-12, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12400ft – 1bf/ft^3 (600 KN-m/m^3)).

1.3 Existing Conditions

.1 Examine the geotechnical report which is bound into this specification.

.2 Refer to dewatering in Section 31 23 33 - Excavating Trenching and Backfilling.

1.4 Protection

.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain. If damaged, restore to original or better condition unless directed otherwise by Departmental Representative.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

PART 2 – PRODUCTS

2.1 Materials

.1 Fill material: in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.

PART 3 – EXECUTION

3.1 Stripping of Topsoil

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.

.2 Commence topsoil stripping of areas as indicated or as directed by Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.

.3 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.

.5 Dispose of unused topsoil off site.

3.2 Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to depths as indicated. Proof roll exposed subgrade.

.3 Slope rough grade away from building as indicated.

.4 Grade ditches to depth required for maximum run-off as indicated.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas in accordance with the Geotechnical Report.

.7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 Proof Rolling

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.2 Obtain approval from Departmental Representative to use non-standard proof rolling equipment.

.3 Proof roll at level in subgrade as indicated. If non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.6 Where proof rolling reveals areas of defective subgrade remove and replace in accordance with this section at no extra cost.

3.4 Stockpiling

.1 Pile excavated fill, suitable for re-use as approved by Departmental Representative, in locations as directed by Departmental Representative.

.1 Stockpile height not to exceed 2 m.

.2 Protect stockpiles from contamination and compaction.

.3 Cover fill that has been piled for long

term storage with anchored water proof and insulated tarps, as required, to resist wind, water and winter conditions. Place straw bales around the stockpile to filter sediment entering or exiting the pile.

3.5 Testing

.1 Quality control testing shall be conducted and paid for by Contractor. Submit results of quality control testing to Departmental Representative for review when requested. Quality assurance inspection and testing will be carried out by a third party designated by the Departmental Representative. Costs of these tests will be paid by Departmental Representative.

3.6 Surplus Material

.1 Remove surplus material and material unsuitable for fill, grading or landscaping off site to satisfaction of Departmental Representative.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedure

.2 Section 01 35 29 - Health and Safety Requirements

.3 Section 31 23 33 - Excavating, Trenching and Backfilling

1.2 Definitions

.1 Rock removal means the removal of material from solid masses of igneous, sedimentary or metamorphic rock which prior to removal was integral with the parent mass and the removal of boulders and rock fragments larger than 1.0 cubic metre in volume.

.2 Rock that can be removed by ripping with an excavator bucket shall not be considered for payment under the rock removal item. It shall be considered common excavation and therefore incidental to the installation of pipe work or other structures.

.3 Frozen material shall not be classified as rock.

1.3 Removal Methods

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris or soil from a previous job site will not be permitted to enter the project site.

.2 Blasting will not be accepted as a method of rock removal. Other method of rock removal is the Contractor’s choice.

.3 Trench rock: rock quantities measured will be depth of rock above the newly installed pipe.

.1 Width will be a total of pipe diameter plus 0.6m (0.3m on each side of pipe) for trench rock excavation as indicated.

.2 Width for excavation for structures to be bounded by vertical planes up

to 300 mm outside and parallel to neat lines for structure installation as indicated.

.3 Total depth of rock for payment will be calculated by adding the depth of rock measured above the new pipe plus the pipe diameter plus 300mm and multiplying by the specified width above and the length of pipe.

.4 There will be no additional payment for rock that is removed by ripping or by hoe-ramming. This shall be considered as incidental to the work

.5 Contractors shall provide all survey equipment needed and provide assistance the Departmental Representative in taking cross sections.

.1 Measurement of rock depth shall be taken every pipe length for trench rock excavation.

.2 Measurements will be submitted to Contractor’s site representative for verification.

.3 Additional measurements shall be taken at points of significant change in elevation or at any other locations as determined by Departmental Representative. Contractor to schedule work to allow sufficient time for the Departmental Representative to take necessary measurements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Rock Disposal

.1 Dispose of surplus removed rock off site. Dispose in locations acceptable to authorities having jurisdiction and the Departmental Representative.

.2 Do not dispose removed rock into landfill. Material must be sent to appropriate location as approved by the Departmental Representative.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 31 05 16 – Aggregate Materials

.2 Section 31 14 13 – Soil Striping and Stockpiling

.3 Section 31 23 16 – Rock Removal

.4 Section 32 11 19 – Granular Sub-Base

.5 Section 32 11 20 – Granular Base

.6 Section 33 05 16 – Manholes and Catch Basin Structures

.7 Section 33 11 16 – Site Water Utility Distribution Piping

.8 Section 33 31 13 – Public Sanitary Utility Sewerage Pipe

.9 Section 33 36 00 – Utility Septic Tanks

.10 Section 35 42 19 – Preservation of Water Courses and Wetlands

1.2 References

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D 698-10, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3).

.5 ASTM D 4318-10, Standard Test

Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA), 1999, c.33.
.2 Transportation of Dangerous Goods Act(TDGA), 1992, c.34.

.4 Newfoundland and Labrador Department of Transportation and Works
.1 Specifications Book (latest edition).

1.3 Definitions

.1 Topsoil:
.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.2 Excavation classes: two classes of excavation will be recognized; common excavation and rock removal.
.1 Rock: the removal of material from solid masses of igneous, sedimentary or metamorphic rock which prior to removal was integral with the parent mass and the removal of boulders and rock fragments larger than 1.0 cubic metre in volume.
.2 Common: all other excavation.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 Borrow material: material obtained from

locations outside area to be graded and required for construction of fill areas or for other portions of Work.

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.6 Unsuitable materials:

.1 Weak, chemically unstable, wet and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318-10, and gradation within limits specified when tested to ASTM D 422-63(2007) and ASTM C 136-06: Sieve sizes to CAN/CGSB-8.2-M88.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10 – 80
0.005 mm	0 – 45

.3 Coarse grained soils containing more than 20% by mass passing 0.075mm sieve.

.7 Contaminated Soil: Soil containing hydro-carbons as identified by sampling performed by an approved testing facility.

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 Submittals

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit to Departmental Representative testing results and reports as described in Part 3 of this section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Inform Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source(s) of fill materials and provide access for sampling.

1.5 Quality Assurance

.1 For design of any temporary structures submit design and supporting data at least 2 weeks prior to installation or construction.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional Engineer who is registered or licensed in Province of Newfoundland and Labrador, Canada in which Work is to be carried out to design and inspect shoring, bracing and underpinning required for Work.

1.6 Existing Conditions

.1 Examine Geotechnical Report prepared by Englobe attached in Appendix B.

.2 Existing buried utilities and structures:

.1 Before commencing work obtain all required digging permits from local utilities and/or authorities and verify and establish location of buried services on and adjacent to site.

.2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.3 Prior to beginning excavation Work, notify applicable owner or authorities to clearly mark such locations to prevent disturbance during Work.

.4 Confirm locations of buried utilities by hand digging or careful test excavations in presence of Departmental Representative. Hand dig all cables one metre either side of cable prior to machine excavation.

.5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.6 Where unidentified utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or otherwise disturbing utilities or structures.

.7 Record location of maintained, re-routed and abandoned underground lines.

.3 Existing surface features:

.1 Conduct, with Departmental Representative, condition survey of existing fencing, trees and other plants, service poles, wires, lighting fixtures, pavement, survey benchmarks and monuments, and all other surface features which may be affected by Work.

.2 Protect existing surface features from damage while Work is in progress unless otherwise directed in the drawings. In event of damage, immediately make repair as directed by Departmental Representative.

.3 Protect existing asphalt and concrete pavements which may be affected by Work from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.4 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.7 Cofferdams, Shoring, Bracing, and Underpinning

.1 Shoring will be required to safely install new piping where depth exceeds 2.5 metres. This is deemed incidental to the work.

.2 Comply with safety requirements and applicable local legislation to protect existing features.

.3 Engage services of qualified Professional Engineer who is registered in the Province of Newfoundland and Labrador to design and inspect shoring and bracing required for work.

.4 At least 2 weeks prior to commencing work, submit design and supporting data.

.5 Design and supporting data submitted to bear the stamp and signature of qualified Professional Engineer licensed in the Province of Newfoundland and Labrador.

PART 2 – PRODUCTS

2.1 Materials

.1 Rock Borrow: Blasted or crushed rock consisting of durable crushed stones, having 100% by mass pass through a 150mm x 150mm screen, and a maximum 10% by mass pass through a maximum 100mm x 100mm screen. Rock to consist of angular fragments obtained by breaking and crushing solid or natural rock, reasonably free from thin, flat elongated or other objectionable pieces and fines or as otherwise approve by the Departmental Representative.

.2 Granular Base in accordance with Section 32 11 20 – Granular Base

.3 Select Backfill Material: from excavations or other sources, approved by the Departmental Representative for use intended, dry, unfrozen and free from rocks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials.

.4 Unshrinkable fill: proportioned and mixed to provide:

- .1 Portland cement: CSA Standard CAN3-A5-M, Type 10 or Type 30 (High Early Strength for winter construction).
- .2 Supplementary cementing materials, when permitted, shall conform to the requirements of CSA Standard CAN3-A23.5-M.
- .3 Fine and coarse aggregate: CSA Standard CAN3-A23.1-M. The gradation shall conform to Table 1 of the CSA Standard for 10 mm minus.
- .4 Mixing water: CAN3-A23.1-M
- .5 Air-entraining admixtures: CSA Standard CAN3-A266.1-M.
- .6 Mix Design for Non-compressible Fill
  - .1 Maximum cement content: 25 kg/m3
  - .2 Maximum strength at 28 days (measured in accordance with CAN3-A23.2-9C): 0.40 MPa

.3 Slump (measured in accordance with CAN3-A23.2-5C):150-200 mm

.4 Air content (measured in accordance with CAN3-A23.2): 4% - 6%

.7 Prior to the production of unshrinkable fill for use, provide to the Owner a certificate from the Owner's testing company stating that the fill to be supplied conforms to the above requirements.

PART 3 – EXECUTION

3.1 Equipment

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris or soil from a previous job site will not be permitted to enter the project site.

3.2 Site Preparation

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 Stockpiling

.1 Stockpile fill materials in areas approved by Departmental Representative and as shown on the drawings.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies. Note that no hay mulch or possible seed contaminants are to be used on this project site.

3.4 Cofferdams and Shoring

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 – Health and Safety Requirements and Health and Safety Act for Workplace NL.

.2 Obtain permit from authority having

jurisdiction for any temporary diversion or pumping of water course.

.3 During backfill operation:
.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.4 Upon completion of substructure construction:
.1 Remove shoring and bracing.
.2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

3.5 Dewatering

.1 Keep excavations free of water while Work is in progress.

.2 Submit for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of Work completed or under construction.
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 Provide settling basins, or other

treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.6 Excavation

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Excavation must not interfere with normal 1:1 (H:V) splay of bearing capacity of adjacent foundations and traffic areas. If interference will occur, excavation must be shored, braced or underpinned as described elsewhere in this specification.

.3 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.4 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.5 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.6 Restrict vehicle operations directly adjacent to open trenches.

.7 Dispose of surplus and unsuitable excavated materials off-site in accordance with applicable provincial and municipal regulations.

.8 Do not obstruct flow of surface drainage or natural watercourses. Diversions of flow are to be submitted in detailed plan and approved by Departmental Representative and other authorities before proceeding.

.9 Earth bottoms of excavations to be undisturbed soil, level, free from loose,

soft or organic matter.

.10 Notify Departmental Representative when bottom of excavation is reached and/or appears unsuitable and proceed as directed by Departmental Representative.

.11 Obtain Departmental Representative's approval of completed excavation.

.12 If encountered, remove unsuitable material from excavation bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.1 In areas occupied by foundations or structures, replace excavated material with Fill Against Structure compacted to not less than 100% Standard Proctor maximum dry density.

.13 Correct unauthorized over-excavation as follows:

.1 In areas not occupied by foundations or structures, replace excavated material with Select Backfill Material compacted to not less than 98% of Standard Proctor Maximum Dry Density.

.14 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.7 Backfill types and compaction

.1 Use types of backfill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.

.1 Aggregate Base Courses (for access roads and paths): compact to 95% of maximum dry density.

.2 Fill Against Structure: compact to 95% of maximum dry density.
.3 Select Backfill Material: compact to 95% of maximum dry density.

3.8 Backfilling

.1 Do not proceed with backfilling operations until completion of following:
.1 Departmental Representative has inspected and approved installations.
.2 Removal of shoring and bracing;
.3 Backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer. Departmental Representative may authorize thicker lifts if it can be shown specified compaction can be achieved.

.5 Backfilling around installations:
.1 Place bedding and surround material as specified elsewhere.
.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
.3 Place layers simultaneously on both sides of installed Work to equalize loading.
.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
.1 Permit concrete to cure for minimum 3 days or until it has sufficient strength to withstand earth and compaction pressure and obtain approval from Departmental Representative.
.5 Place unshrinkable fill in areas as

indicated.

.1 When the Engineer designates that unshrinkable fill is to be placed as backfill when a utility has been repaired or installed, bedded and protected with sand as required, fill the trench with non-viscous, non-compressible fill, up to the underside of pavement materials.

.2 When unshrinkable fill is being used in a watermain trench, place full-width horizontal 50 mm polystyrene board insulation at approximately 100 mm above buried pipe.

.3 Consolidate and level unshrinkable fill with internal vibrators.

.6 Backfilling at surface:

.1 Shall be re-used existing stockpiled topsoil, where excavation is outside of paved or granular surfaces.

3.9 Restoration

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 33 – Excavating, Trenching and Backfill.

.2 Section 31 37 00 – Rip Rap.

1.2 Definitions

.1 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Waste material: material unsuitable for use in embankment or surplus to requirements.

.3 Borrow material: Rock Borrow material obtained from areas off site required for construction of embankments or for other portions of work.

.4 Embankment: Material derived from usable excavation and placed above original ground or stripped surface up to subgrade.

.5 Pavement structure: combination of layers of unbound or stabilized granular sub-base, base, and asphalt or concrete surfacing.

.6 Subgrade elevation: elevation immediately below pavement structure.

1.3 Traffic Provisions

.1 Provide and maintain roadways, walkways and detours, for vehicular and pedestrian traffic and access to fire hydrants, alarms and emergency telephones.

PART 2 - PRODUCTS

2.1 Materials

.1 Embankment materials shall meet the approval of the Departmental Representative.

.2 Material used for embankment not to contain organic matter, frozen lumps, weeds, sod, roots, logs, stumps, boulders larger than 150 mm or any other unsuitable material.

.3 Embankment Material:
- .1 Rock Borrow: in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.
- .2 Rip Rap: in accordance with Section 31 37 00 – Rip Rap.

PART 3 - EXECUTION

3.1 Compaction Equipment

.1 Compaction equipment must be capable of obtaining required densities in materials on project.
- .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
- .2 Replace or supplement equipment that does not achieve specified densities.

.2 Operate compaction equipment continuously in each embankment when placing material.

.3 Minimum roller size: 9t

3.2 Water Distributors

.1 Apply water with equipment capable of uniform distribution.

3.3 Embankments

.1 Remove topsoil and rootmat.

.2 Cold Mill existing pavement to elevations shown as directed.

.3 Do not place material which is frozen nor place material on frozen surfaces.

.4 Maintain a crowned surface during construction to ensure ready runoff of surface water. Do not place material in free standing water.

.5 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.

.6 Compaction:
- .1 Place and compact to full width in uniform layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.2 Compact to a density of not less than 95% corrected maximum dry density in accordance with ASTM D698.

.3 Bring moisture content of soil to level required to achieve specified compaction. Add water or aerate as required.

.4 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.5 Ensure required compaction for each layer before placing any material for next layer.

3.4 Excavations

.1 Excavate fill or bedrock to subgrade level in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

3.5 Subgrade Compaction

.1 After grading has been completed, scarify and mix subgrade surface to required depth of subgrade compaction.

.2 Remove unsuitable materials found during work. Replace with material approved by Departmental Representative

.3 Bring moisture content of soil to level required to achieve specified compaction. Add water or aerate as required.

3.6 Finishing and Tolerances

.1 Shape and compact surfaces to within 30 mm of design elevations but not uniformly high or low.

.2 Do scarifying, grading, compacting or other methods of work as necessary to provide thoroughly compacted roadbed shaped to grades and cross sections as indicated or as directed by Departmental Representative.

.3 Finish edges and slopes of common material to neat condition, true to line and grade.

.1 Remove isolated boulders exposed in cut slopes and fill resulting cavities.

.2 Hand finish slopes that cannot be finished satisfactorily by machine.

3.7 Maintenance

.1 Maintain finished surfaces in condition conforming to this section until acceptance.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 33 11 16 – Site Water Utility Distribution Piping

PART 2 - PRODUCTS

2.1 Rock

.1 Hard, with relative density (formally specific gravity) not less than 2.5, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.2 To meet following size distribution per sizes shown on drawings and graded as follows:

.1 Nominal 200mm diameter or 10 kg mass:
100% smaller than 350mm or 70 kg
At least 20% larger than 250 mm or 25 kg
At least 50% larger than 200mm or 10 kg
At least 80% larger than 150mm or 5 kg

.2 Nominal 300mm diameter or 40 kg mass:
100% smaller than 450mm or 130 kg
At least 20% larger than 350 mm or 70 kg
At least 50% larger than 300mm or 40 kg
At least 80% larger than 200mm or 10 kg

.3 Rip rap to be clean, inorganic, non ore-bearing, non-toxic material from a non-watercourse source. It shall be hard, resistant to weathering and angular in shape.

2.2 Geotextile Filter

.1 Geotextile: non-woven type meeting the following minimum requirements (Minimum Average Roll (MAR) Values):

PROPERTY	UNIT	ASTM TEST	NON-WOVEN
Mullen Burst Strength	KPa	D3786	1110
Tearing Strength (Trapezoid Method)	N	D4533	160(N1)
Grab Tensile Strength (Both Directions)	N	D4632	400(N1)
Elongation at Break	%	D4632	50
Apparent Opening Size	Um	D4751	50-250
UV Degradation	% Ret	D4355	
Permittivity	Sec - 1	D4491	1.75 - 3.50

PART 3 - EXECUTION

3.1 Equipment

.1 All equipment brought on site by the contractor or any subcontractor must be thoroughly washed clean of any soil and debris prior to arrival on site. Equipment containing debris or soil from a previous job site will not be permitted to enter the project site.

3.2 Placing

.1 Place Rip-Rap in the locations and to the grade, dimensions, and details as shown on the drawings or as laid out by the Department Representative.

.2 Where Rip-Rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.

.3 Dewater the site as required to permit the work to be carried out.

.4 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide a firm bed.

.5 Place geotextile on prepared surface. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.

.6 Place stones using appropriate equipment

in manner approved by Department Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

.7 Place stones without damaging adjacent structures or geotextile material.

.8 Place rip-rap to thickness and details as indicated.

.9 Hand placing:
- .1 Use larger stones for lower courses and as headers for subsequent courses.
- .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
- .3 Finish surface evenly, free of large openings and neat in appearance.

END

PART 1 – GENERAL

1.1 Section Includes

.1 Saw cutting of existing asphalt.

.2 Removal of existing asphalt by means of asphalt cold-milling.

.2 Removal of remaining asphalt by excavator or other means for storage/disposal at an approved disposal site.

PART 2 – PRODUCTS

.1 (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Preparation

.1 Prior to commencing removal operation, inspect and verify with Department Representative areas, depths and lines of asphalt concrete pavement to be removed.

3.2 Equipment

.1 The cold-milling operation shall be accomplished using a cold-milling machine. The cold-milling machine shall be a self-driven rotating drum type, capable of removing asphalt up to 100 mm thick and at least 1200 mm wide in a single pass. Cutting depth shall be 75 mm. The machine shall have automatic grade control and be able to load milled material directly into trucks or be able to windrow the material for subsequent pick-up by other equipment.

3.3 Removal by Cold Milling

.1 Remove asphalt along existing paved roadways beyond the limits of the trench shall by means of cold milling to the limits as indicated. The Contractor shall mill a 600mm keyway to tie into existing asphalt on one or all sides of the trench as required.

.2 All residue left by the cold-milling process shall be removed immediately from the road. Mechanical sweeping shall be performed at the end of each day’s operations. Any guide sweeping

operations shall be cleaned to the satisfaction of the Departmental Representative.

.3 The Contractor shall dispose of residue at an approved waste disposal area provided by the Contractor at his own expense.

.4 Prevent contamination of the removed asphalt concrete pavement by topsoil, underlying gravel or other materials.

.5 Provide for suppression of dust generated by removal process.

3.4 Full Depth Asphalt Removal

.1 For full depth asphalt removal, the Contractor shall saw cut the full depth of existing asphalt as indicated on the Drawings to produce a clean edge.

.2 Asphalt can then be removed using a conventional excavator or earth moving equipment as selected by Contractor.

.3 Transport all removed material for storage or disposal at an approved disposal site located outside the park boundaries. Contractor to obtain approvals for disposal or storage at the site selected from all applicable regulatory authorities (including the Department of Environment & Conservation) and provide a copy of such approvals to the Departmental Representative prior to project start-up. The Contractor owns and is responsible for all asphalt material removed off-site.

.4 Grade existing road being uncovered by asphalt removal operations on a regular basis.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 24 13 – Roadway Embankments.

.2 Section 31 05 16 - Aggregates: General.

.3 Section 31 23 33 – Excavating Trenching and Backfilling.

1.2 References

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C 117-13, Standard Test Methods for Material Finer Than 75-micro m (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM D6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
- .5 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ftn) (600kN-m/mn).
- .6 ASTM D 1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .7 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

PART 2 - PRODUCTS

2.1 Materials

.1 Granular "B" Sub-base Material: in accordance with Section 31 05 16 – Aggregates: General and following requirements:

- .1 Crushed rock.
- .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- .3 Gradations to be within limits specified when tested To ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 AND

CAN/CGSB-8.2.

.4 Table:

Sieve Designation	% Passing
50.8 mm	100
25.4 mm	50 – 100
4.76 mm	20 – 55
1.20 mm	10 – 35
0.300 mm	5 – 20
0.075 mm	2 – 6 (Pit Source)
	2 – 8 (Rock Source)

.5 Other Properties as follows:
- .1 Liquid Limit: to ASTM D 4318, Maximum 25.
- .2 Plasticity Index: to ASTM D 4318 Maximum 0.
- .3 Los Angeles degradation: to ASTM C131. Max % loss by mass: 35.
- .4 Crushed Particles: at least 50% of particles by mass retained on the 4.75 mm sieve to have at least two (2) fractured faces.

.6 Particles smaller than 0.02 mm: to ASTM D 422, Maximum 3%.

.7 Flat and elongated particles: maximum percent by mass: 15.

.8 Granular Subbase shall not consist of sandstone.

.2 Shouldering material, composed of crushed rock and gravel to the gradations listed above.

PART 3 - EXECUTION

3.1 Inspection of Underlying Sub-Base

.1 Place granular sub-base after surface is inspected and approved by Departmental Representative.

.2 Underlying material to be compacted to 100% of Standard Proctor Density to ASTM D698

3.2 Placing

.1 Place granular sub-base after subgrade is to the satisfaction of the Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean, unfrozen surface, free from snow or ice.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace portion of layer in which material has become segregated during spreading.

.9 Place and compact shouldering to 2% cross slope in reconstruction areas. In overlay sections, feather new shoulder material from top of new asphalt to rounding of shoulder slope.

.10 Compacted shouldering to be flush with asphalt concrete surface.

.11 Hand work will be required to form base for asphalt concrete gutters/offtakes.

.12 Place, hand rake and compact new shoulder material under and behind guiderail.

3.3 Compaction

.1 Compaction equipment to be vibratory-type and capable of obtaining required material densities.

.2 Compact to density of not less than 100% of Maximum Dry Density in accordance with ASTM D 698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers to the satisfaction of the Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 Site Tolerances

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 Protection

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by the Departmental Representative.

.2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.3 Shouldering cross slope is to be 2% or match the cross slope of the roadway surface, whichever is steeper.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 05 16 – Aggregate Materials

.2 Section 31 23 33 – Excavating, Trenching and Backfilling.

.3 Section 32 11 19 – Granular Sub-Base

1.2 References

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C 117-13, Standard Test Methods for Materials Finer Than 75-mirco m Sieve in Mineral Aggregates by Washing.
- .2 ASTM D 6928-10, Standard Test Method for Resistance of coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ftn) (600kN-m/mn).
- .5 ASTM D 1883-07e1, Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils.
- .6 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

PART 2 - PRODUCTS

2.1 Materials

.1 Granular base: material in accordance with Section 31 05 16 – Aggregates: General and following requirements.

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.3 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.

.1 Gradation to:

Sieve Designation	% Passing
25 mm	100
12.5 mm	65-100
4.75 mm	35-60
2.00 mm	22-45
0.425 mm	10-25
0.075 mm	3-8

.2 Liquid limit: to ASTM D 4318, maximum 25.

.3 Plasticity index: to ASTM D 4318, maximum 0.

.4 Los Angeles degradation: to ASTM C131. Maximum % loss by mass: 35.

.5 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least one (1) freshly fractured faces. Material to be divided into ranges using methods of ASTM C 136.

.6 Flat and elongated particles: maximum by mass: 15%.

PART 3 - EXECUTION

3.1 Placing

.1 Place granular base after sub-base or subgrade surface is inspected and approved by the Departmental Representative.

.2 Construct granular base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow and ice.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.2 Compaction

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density not less than 100% of standard proctor Maximum Dry Density in accordance with ASTM D 698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers to the satisfaction of the. Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 Site Tolerances

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

.2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 Protection

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by the Departmental Representative.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 05 16 – Aggregate Materials.

.2 Section 32 11 20 – Granular Base

1.2 References

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C 117-95, Standard Test Methods for material finer than 0.075 mm Sieve in Mineral aggregates by washing.
- .2 ASTM C 131-96, Standard Test Method for Resistance to degradation of small-size coarse aggregate by abrasion and impact in the Los Angeles machine.
- .3 ASTM C 136-96a, Standard Test Method for Sieve analysis of fine and coarse aggregates.
- .4 ASTM D 698-00a, Standard Test Methods for laboratory compaction characteristics of soil using standard effort (12,400ft-lbf/ft^3) (600kN-m/m^3).
- .5 ASTM D 1557-00, Test Method for laboratory compaction characteristics of soil using modified effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).
- .6 ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of laboratory compacted soils.
- .7 ASTM D 4318-00, Standard Test Methods for liquid limit, plastic limit and plasticity index of soils.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.2-M88, sieves, testing, woven wire, metric.

1.3 Delivery, Storage and Handling

.1 Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials. Stockpile minimum 50% of total bedding material/aggregate required prior to beginning operation.

1.4 Waste Management And Disposal

.1 Remove un-used bedding material from site.

PART 2 – PRODUCTS

2.1 Materials

.1 Pipe Bedding Material: Bedding material shall consist of well graded sand or granular material free of clay, frozen lumps, organic or deleterious matter and meet the gradation limits specified below:

Sieve Designation (mm)	Percent Passing
25	100
19	75-100
12.5	-
9.5	50-100
4.75	30-70
2	20-45
0.425	10-25
0.18	-
0.075	3-8

.2 Granular base shall also be accepted as a pipe bedding material. For Specification on Granular Base, see Section 32 11 20 – Granular Base

.3 Stone Bedding Material: Stone bedding shall be used only as deemed necessary by the Departmental Representative in wet trenches where de-watering is not possible. Stone bedding shall consist of approved, well graded material free of clay, frozen lumps, organic or deleterious matter; and meet the gradation limits as specified below.

Sieve Designation (mm)	Percent Passing
25.4	100
19	75-100
9.5	0-75
4.75	0-15
2.36	0-5

When using stone bedding, the entire pipe bedding zone must be completely enveloped

with geotextile fabric to prevent the migration of fine from the surrounding soil.

PART 3 – EXECUTION

3.1 Sequence of Operation .1 Placement

.1 Place pipe bedding material and compact as necessary to meet the grades shown on the drawings.

.2 Ensure no frozen material is placed.

.3 Place material only on properly shaped, clean unfrozen surface, free from snow and ice.

.4 Place material using methods which do not lead to segregation or degradation of aggregate.

.5 Place bedding material to a thickness of 150mm below the underside of pipe when the trench is not in solid rock. If the trench is in solid rock, the bedding material shall be placed 300mm thick below the underside of pipe.

.6 Bedding material shall be placed to a width of 300mm beyond the outside of the pipe, on both sides as well as 300mm thick on top of the pipe.

.7 Bedding shall be placed in uniform layers not exceeding 150mm compacted thickness. Departmental Representative may authorize thicker layers if specified compaction can be achieved.

.2 Compaction Equipment

.1 Compaction equipment to be capable of obtaining required material densities.

.3 Compacting

.1 Compact to density not less than 95% corrected maximum dry density in accordance with ASTM D698, latest edition.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified

density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 32 12 16 – Hot-Mix Asphalt Concrete Paving

1.2 References

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM D 140-2009, Standard Practice foR Sampling Bituminous Materials.
- .2 ASTM D 244-09, Standard Test Methods and Practices for Emulsified Asphalts.
- .3 ASTM D 997-13, Standard Specification for Emulsified Asphalt.

1.3 Environmental Provisions

.1 Tack coat spills larger than 70 L shall be immediately reported to the Newfoundland and Labrador Department of Environment & Conservation and the Departmental Representative.

.2 The Contractor shall take such steps as are necessary to abate the discharge, clean up the area affected, dispose of waste materials in an approved waste disposal site, and restore the environment to the satisfaction of the Newfoundland and Labrador Department of Environment & Conservation and the Departmental Representative, all at the Contractor’s expense.

PART 2 – PRODUCTS

2.1 Materials

.1 Emulsified Asphalt: Type SS-1 or Type SS-1h emulsified asphalt, to ASTM D 997 as the tack coat material.

- .1 The Departmental Representative shall be notified in advance as to which type the Contractor intends to use and the tack coat shall meet the following standards.

.2 Water: Water for forming the solution shall be clean water free from impurities.

PART 3 – EXECUTION

3.1 Equipment

.1 Tack coat shall be applied by means of an approved pressure distributor equipped with thermometer, pressure gauge, fifth wheel tachometer and suitable spray nozzles which shall all be of the same orifice and manufacturer and capable of producing a fog-type spray. The slot of each nozzle shall be set at 30 degrees to the axis of the spray bar and the spray bar shall be set at a height above the existing pavement that will permit the fan from each nozzle to overlap its neighbouring fan by exactly half.

3.2 Application

.1 Obtain Departmental Representative's approval of existing surface before applying asphalt tack coat. Clean surface as required.

.2 Tack coat shall only be placed on surfaces that are clean and dry and then only when the atmospheric temperature is at least 10°C and when rain is not forecast within 2 hours of application.

.3 Should the surface to be treated be dirty, then the Contractor shall thoroughly clean the surface by means of a power broom, or equivalent.

.4 The Contractor shall plan his work so that no more tack coat than is necessary for the day's paving operation is applied at one time.

.5 Paint contact surfaces of existing abutting asphalt surface with thin, uniform coat of asphalt tack coat material.

.6 To avoid nuisance and possible property damage to the travelling public, the Contractor shall install portable traffic lights or other means of directing one-way traffic while working on the adjacent part of the road.

.7 Type SS-1 or Type SS-1h emulsion shall be diluted with an equal volume of water prior to the application. The diluted SS-1 or SS-1h emulsion shall be applied at a rate of 0.3 to 0.5 l/m^2 of diluted emulsion on old pavement. Both the mixing temperature and the application temperature shall be between 20°C and 50°C. Care must be exercised not to exceed the recommended application rate.

.8 Tack coat application shall be visually uniform. Areas of insufficient or non-uniform tack coat coverage shall be corrected by the contractor at no cost to Canada.

.9 Where traffic is to be maintained, treat no more than one half of width of surface in one application.

.10 Keep traffic off tacked areas until asphalt tack coat has set.

.11 Re-tack contaminated or disturbed areas as directed by Departmental Representative.

.12 Permit asphalt tack coat to set before placing asphalt pavement.

3.3 Curing

.1 No hot mix shall be placed upon the tack coat until it has dried to a proper condition of tackiness, as determined by the Departmental Representative. The Contractor is advised that the period required for such drying will depend upon weather conditions.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 01 35 43 - Environmental Procedures.

.2 Section 31 05 16 – Aggregates Material.

.3 Section 32 11 20 - Granular Base.

.4 Section 32 17 23 – Pavement Markings.

.5 Section 32 12 13 – Asphalt Tack Coat.

1.2 References

.1 ASTM International

.1 ASTM C 88-13, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C 117-13, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C 123-12, Standard Test Method for Lightweight Particles in Aggregate.

.4 ASTM C 127-12, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.5 ASTM C 128-12, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

.6 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.7 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.8 ASTM C 207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.

.9 ASTM D 995--95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.10 ASTM D 2419-09, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.11 ASTM D 3203-11, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.12 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.13 ASTM D 6373-13, Standard Specification for Performance Graded Asphalt Binder
.14 ASTM D 6927-06, Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
.15 ASTM D 6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
.16 ASTM C 1252-06, Standard Test Methods for Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
.17 ASTM D 4867, Standard Test for Effect of Moisture on Asphalt Concrete Paving Mixtures (Lottman Test)

.2 Government of Newfoundland and Labrador, Department of Transportation and works, Highway Design Division.
.1 The Department of Transportation and Works (DTW) specifications Book, latest edition.

1.3 Supply of Materials

.1 Notify Departmental Representative of proposed date for use of materials; order and schedule shipments to coincide with construction schedule.

1.4 Source Sampling

.1 At least 4 weeks prior to commencing work inform Departmental Representative of proposed source of aggregates and provide access for sampling.
.1 A copy of the location letter shall be forwarded to the Superintendent, Terra Nova National Park.

1.5 Material Certification

.1 Submit manufacturer's test data and certification that asphalt cement meets requirements of this section.

1.6 Submission of Mix Design

.1 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for review at least 4 weeks prior to commencing work.

.2 All asphalt concrete mix supplied for the work shall conform to the requirements of the 'surface course' designation.

1.7 Delivery and Storage

.1 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregates: General. Stockpile minimum 50% of total amount of aggregate required before commencing asphalt mixing operation.

.2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.

.3 Stockpile fine aggregate separately from coarse aggregate.

.4 Provide approved storage, heating tanks and pumping facilities for asphalt cement.

.5 Furnish copies of freight and weigh bills for asphalt cement as shipments are received. Departmental Representative reserves right to check weights as material is received.

PART 2 – PRODUCTS

2.1 Materials

.1 Asphalt cement: PG 58-28 in accordance with ASTM D6373.

.2 Aggregate material to following requirements:
.1 Crushed rock consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, and other deleterious materials.
.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on semi-log grading chart.

Sieve Designation		Surface Course % Passing
19.0	mm	100
12.5	mm	93 – 100
9.5	mm	75 – 92
4.75	mm	55 – 75
2.00	mm	32 – 55

0.425	mm	12 – 25
0.150	mm	5 – 12
0.075	mm	2 – 5

.3 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm when tested to ASTM C136.

.4 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.

.5 Coarse aggregate stockpile shall contain no more than 15% passing 4.75 mm sieve.

.6 Fine aggregate stockpile shall contain no more than 15% retained on 4.75 mm sieve.

.7 Petrographic Number: CSA A23.2 – 15A, Max: 135.

.8 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.9 Sand equivalent: ASTM D2419 Min: 50

.10 Magnesium Sulphate Soundness: ASTM C88. Max.% loss by mass: Coarse aggregate, surface course: 12. Fine aggregate, surface course: 16

.11 Los Angeles abrasion; Gradation B. to ASTM C131. Max. % loss by mass: Coarse aggregate, surface course: 35

.12 Absorption: ASTM C127, max. % by mass: Coarse aggregate, surface course: 1.75

.13 Loss by washing: to ASTM C117. Max. % passing 0.075 mm sieve: Coarse aggregate, surface course: 1.75

.14 Flat and elongated particles with length to thickness ratio greater than 4: Max. % by mass: Coarse aggregate, surface course: 20

.15 Crushed fragments at least 100% of particles by mass within each of following sieve designation ranges to have at least 2 freshly fractured faces. Material to be divided into ranges using methods of ASTM C136.

Passing		Retained on
19.0 mm	to	12.5 mm
12.5 mm	to	4.75 mm

.16 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
.17 Micro – Deval abrasion, to ASTM D6928, Coarse aggregate: Max. 20%.
.18 Micro – Deval abrasion, to CSA A23.2 – 23A, Fine aggregate: Max 20%.
.19 Fine aggregate angularity, to ASTM C1252, Min. 45%.

.3 Mineral filler:
.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non- plastic mineral matter, thoroughly dry and free from lumps.
.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
.3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 Mix Design

.1 Job mix formula to be provided by Contractor and designed and certified by a Professional Engineer licensed to practice in the Place of Work. Job mix formula to be approved by Departmental Representative.

.2 Design of mix: by Marshall method to requirements below and as directed by Departmental Representative.
.1 Compaction blows on each face of test specimens: 75.
.2 Mix physical requirements:
1. Marshall Stability at 60°C: 10000 N(minimum)
2. Flow Value mm: 2 to 4.25
3. Air Voids in Mixture, %: 3-5
4. Voids in Mineral Aggregate, % minimum: 15
5. Index of Retained Stability % Minimum: 75
.3 Measure physical requirements as follows:
.1 Marshall load and flow value: to ASTM D6927.
.2 Air voids: to ASTM D3203.
.4 Do not change job-mix without prior approval of Departmental Representative.

Should change in material source be proposed, new job-mix formula to be reviewed by Departmental Representative.

.5 Return plant dust collected during processing to mix in quantities acceptable to Departmental Representative.

.6 Asphalt content: 5.5-6.25% based on total weight.

.7 Asphalt mixtures containing RAP shall be designed in accordance with the latest edition of the Asphalt Institute Manual Series No. 2.

.8 The quality of the final pavement mixture shall meet all requirements set forth in this specification.

.9 Use liquid type anti-stripping agent. Ensure compatibility with cement being used. Tensile Strength Ration (TSR) required is 80% minimum.

PART 3 – EXECUTION

3.1 Plant and Mixing Requirements

.1 Batch and continuous mixing plants:

.1 To ASTM D995.

.2 Heat asphalt cement and aggregate to mixing temperature directed by Departmental Representative. Do not heat asphalt cement above 160°C.

.3 Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements.

.4 Make available current asphalt cement viscosity data at plant. With information relative to viscosity of asphalt being used, Departmental Representative will direct temperature of completed mix at plant and at paver after considering hauling and placing conditions.

.5 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.

.6 Feed cold aggregates to plant in proportions that will ensure continuous operations.

.7 Immediately after drying, screen aggregates into hot storage bins in sizes

to permit recombining into gradation meeting job-mix requirements.

.8 Store hot screened aggregates in a manner to minimize segregation and temperature loss.

.9 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

.10 Maintain temperature of materials within plus or minus 5°C of specified mix temperature during mixing.

.11 Mixing time:

.1 In batch plants, both dry and wet mixing times as directed by Departmental Representative. Continue wet mixing as long as necessary to obtain a thoroughly blended mix but not less than 30 s or more than 75 s.

.2 In continuous mixing plants, mixing time as directed by Departmental Representative but not less than 45 s.

.3 Do not alter mixing time unless directed by Departmental Representative.

.2 Dryer drum mixing plant:

.1 Feed aggregates to burner end of dryer drum by means of a multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.2 Meter total flow of aggregate by an electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and asphalt entering mixer remain constant.

.3 Provide for easy calibration of weighing systems for aggregates without having material enter mixer.

.4 Calibrate individual feed bin conveyors to ensure mix proportions are achieved.

.5 Make provision for conveniently sampling the full flow of materials from the cold feed.

.6 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate from cold feed prior to entering drum.

.7 Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.

.8 Accomplish heating and mixing of asphalt mix in an approved parallel flow dryer-mixer in which aggregate and asphalt enter drum at burner end and travel parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with a printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each day.

.9 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 1%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.

.2 Do not store asphalt mix in storage bins in excess of 3 h.

.4 While producing asphalt mix for this project, do not produce mix for other users unless separate storage and pumping facilities are provided for materials supplied to this project.

.5 Mixing tolerances:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass):

4.75 mm sieve and larger	5.0
2.00 mm sieve	4.0
0.425 mm sieve	2.5
0.075 mm sieve	1.0

.2 Permissible variation of asphalt cement from job mix, 0.30%
.3 Permissible variation of mix temperature at discharge from plant, 10°C.

3.2 Equipment

.1 Pavers: mechanical (grade controlled) self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers, general: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

.3 Haul trucks: of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
.1 Boxes with tight metal bottoms.
.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
.3 In cool weather or for long hauls, insulate entire contact area of each truck box.
.4 Trucks which cannot be weighed in single operation on scales supplied will not be accepted.

.4 Hand tools:
.1 Lutes or rakes with covered teeth for spreading operations.
.2 Provide tamping irons having mass not less than 12 kg and a bearing area not exceeding 310 cm2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.
.3 Straight edges, 4.5 m in length, to test finished surface.

3.3 Preparation

.1 Reshape granular roadbed to Departmental Representative’s approval.

.2 Prior to laying mix, clean surfaces of loose and foreign material.

.3 Saw cut adjacent asphalt surfaces and prior to placing new asphaltic pavement.

.4 Tack coat existing asphalt surfaces and edges prior to placing new asphalt mix in accordance with Section 32 12 13 – Asphalt Tack Coat.

.5 Construct key joint at locations where the new top lift of asphalt will meet existing asphalt as indicated on the drawings.

3.4 Transportation of Mix

.1 Transport mix to job site in vehicles cleaned of foreign material in good mechanical working order, tight gates and with tarps.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted.

.3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light.

.4 Deposit mix from surge or storage silo into trucks in multiple drops and use methods necessary to prevent segregation.

.5 Deliver materials to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.

.6 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at a temperature within range directed, but not less than 130°C.

3.5 Placing

.1 Obtain Departmental Representative’s approval of base prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines indicated or directed by Departmental Representative.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5°C.

.2 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 A material transfer device shall be used for the placement of all asphalt mix on the project. Prior to use, the material transfer device shall be approved by the Departmental Representative.

.4 Place asphalt concrete in compacted lifts of thickness as noted on the plans.

.5 Spread and strike off mixture with self-propelled mechanical finisher:

.1 Construct longitudinal joints and edges true to line markings. Lines for paver to follow will be established by Departmental Representative parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.

.3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.4 Correct irregularities in alignment left by paver by trimming directly behind machine.

.5 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.

.6 Do not throw surplus material on freshly screeded surfaces.

.6 When hand spreading is used:

.1 Approved wood or steel forms, rigidly supported to assure correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn material. Do not use tools at a higher temperature than temperature of mix being placed.

3.6 Compacting

.1 Roll asphalt continuously to a density not less than 93% of the mix maximum theoretical density.

.2 General:

.1 Provide minimum three (3) rollers and as many additional rollers as necessary to achieve specified pavement density. One roller must be pneumatic-tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without undue displacement of material or cracking of surface.

.3 Operate rollers slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel- wheeled rollers and 8 km/h for pneumatic-tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel.

.5 Overlap successive passes of roller by at least one half width of roller and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism.

.8 Do to permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.3 Breakdown rolling:

.1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators for this work.

.4 Second rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling shall be continuous after initial rolling until mix placed has been thoroughly compacted.

.5 Finish rolling:

.1 Accomplish finish rolling with two- axle or three-axle tandem steel wheel rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, Departmental Representative shall specify use of pneumatic-tired rollers.

.2 Conduct rolling operations in close sequence.

3.7 Joints

.1 General:

.1 Trim vertical face by sawcutting to provide true surface and cross section against which new pavement may be laid. Remove loose particles.

.2 Paint joint face with thin coat of hot asphalt cement or cutback asphalt or preheat joint face with approved heater, prior to placing of fresh mix.

.3 Overlap previously laid strip with spreader by 100 mm.

.4 Remove surplus material from surface of previously laid strip. Do not dispose on surface of freshly laid strip.

.5 Construct joints between asphalt concrete pavement and portland cement concrete pavement as directed by Departmental Representative.

.6 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Construct and thoroughly compact transverse joints to provide a smooth riding surface.

.2 Stagger joint locations 2 m.

.3 Offset transverse joint in succeeding lifts by at least 600 mm.

.3 Longitudinal Joints:

.1 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with a lute or rake.

.2 Roll longitudinal joints directly behind paving operation.

.3 When rolling with static roller, shift roller over onto previously placed lane in order that 100 to 150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.4 When rolling with static or vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.5 Offset longitudinal joints in succeeding lifts by at least 150 mm.

3.8 Finish Tolerances

.1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5mm when checked with a 4.5 m straight edge place in any direction.

3.9 Defective Work

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling or segregation.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.10 Hours of Work

.1 Unless specifically authorized otherwise by the Departmental Representative, all spreading of asphalt mix shall stop at least 1/2 hour before sunset and the paver shall be off the road by sunset.

3.11 Pollution Control/Site Clean-up

.1 Control emissions from equipment and plant to Site Clean-up Provincial emission requirements.

.2 Copies of the Contractor's current Provincial Asphalt Plant Approval Permit must be provided to PCA and the EPO.

.3 Excess asphaltic concrete material must be disposed of at approved locations. No material will be deposited outside the lines and grades indicated for asphalt paving, except as approved by the Departmental Representative.

.4 The EPO on behalf of Provincial Department of Environment and Conservation will be monitoring the Contractor's operation, including site cleanup.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 31 24 13 – Roadway Embankments.

.2 Section 32 11 20 – Granular Base.

1.2 Definitions

.1 Flake equivalent Tonne: method used to convert aqueous Calcium Chloride to its equivalent mass of Type 1 Regular flake Calcium chloride, is as follows:

$$FE = \frac{M \times C}{77{,}000}$$

Where:

FE = Number of flake equivalent tonnes.

M = Mass of solution in kilograms.

C = Percentage of Calcium Chloride in solution.

1.3 Delivery, Storage and Handling

.1 Provide Departmental Representative with name of product, name of manufacturer, net weight or mass, and percentage of Calcium Chloride guaranteed by manufacturer.

.2 Deliver, store and handle materials in accordance with manufacturer’s written instructions.

PART 2 – PRODUCTS

2.1 Calcium Chloride Flakes

.1 To CGSB Specification 15-GP-1M Calcium Chloride Type 1 Regular (77%).

2.2 Aqueous Calcium Chlorides

.1 To CGSP 15-GP-1M Calcium Chloride – 35% concentration by weight of anhydrous produce.

PART 3 – EXECUTION

3.1 Preparation of Surfaces

.1 When requested by the Department Representative, apply Calcium Chloride after fine grading of surface.

3.2 Application

.1 Apply Calcium Chloride uniformly over centre 7 m of roadway at rate of 5 Flake Equivalent tonnes/km unless otherwise directed by Departmental Representative.

.2 Immediately after applying Calcium Chloride flakes, apply water at rate of 15 tonnes/km or until Calcium Chloride spreads to edge of roadway.

END

PART 1 – GENERAL

1.1 Description

.1 Contractor responsible for permanent lines and pavement markings in areas where pavement markings currently exist (Newman Sound Main Campground, Malady Head Campground and Highway 310).

.2 This standard applies to low temperature, water-borne, acrylic, fast drying traffic paints suitable for spray application with specialized equipment, to asphalt surfaces. Included are centre lines to match existing layout (double solid, solid/dash or single dash lines), two shoulder lines, as well as any intersections, arrows, delineation, special markings, parking stalls, and temporary markings, etc., for all of Newman Sound Campground and Malady Head Campground as well as Highway 310, within the limits of the work.

.3 This specification includes a compound to be used as an additive in conjunction with water-borne traffic paint and glass spheres to provide a drying agent which accelerates the no-tack time of the water-borne traffic paint. No-tack time is to be increased by approximately 40% over the same paint without the compound.

.4 All pavement markings to be in accordance with the Manual of Uniform Traffic Devices for Canada, latest edition.

1.2 References

.1 American Society for Testing and Materials (ASTM)
.1 ASTM D 711, Test Method for No-Pick-Up Time of Traffic Paint
.2 ASTM D 868, Test Method for Evaluating Degree of Bleeding of Traffic Pain
.3 ASTM D 869, Test Method for Evaluating Degree of Settling of Paint

.4 ASTM D 969, Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint
.5 ASTM D 1155, Test Method for Roundness of Glass Spheres
.6 ASTM D 1210, Test Method for Fineness of Dispersion of Pigment-Vehicle Systems
.7 ASTM D 1214, Test Method for Sieve Analysis of Glass Spheres
.8 ASTM D 1309, Test Methods for Settling Properties of Traffic Paints During Accelerated Storage
.9 ASTM D 2205, Guide for Selection of Tests for Traffic Paints
.10 ASTM D 2243, Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
.11 ASTM D 3960, Standard Practice for Determining Volatile Organic Compound (VOC)Content of Paints and Related Coatings
.12 ASTM E 97, Test Method for Directional Reflectance Factor of Opaque Specimens by Broad-Band Filter Reflectometry

.3 Transportation Association of Canada (TAC), Manual of Uniform Traffic Control Devices For Canada.

1.3 Samples

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Mark samples with name of project, location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.

.3 The Departmental Representative reserves the right to test samples of paint at the point of delivery, from any or all batches of paint to be used. The samples will be tested and all paint from any batch tested that does not meet specifications, will not

be permitted to be used on this project.

PART 2 – PRODUCTS

2.1 Materials

.1 General Requirements:

.1 The low temperature, water-borne (acrylic), lead free, fast drying traffic paints shall be designed to be applied in environmental conditions such that operational temperatures shall be in the range of 2 degrees Celsius and rising.

.2 Paint shall be well ground to a uniform smooth consistency and shall be free from skin, dirt and other foreign particles. The paint shall be capable of being sprayed at the temperature intended for the paint. It shall flow evenly and smoothly and cover solidly when applied to pavement. The paint shall be supplied ready-mixed for use without any addition of water.

.3 The paint mixture shall include the glass bead intermix system.

.4 The paint mixture is to be able to be applied under pneumatic pressure by a standard truck mounted dispensing machine moving at speeds of 8 to 24km/hr.

2.2 Paint

.1 Paint to this standard shall comply with the following detail requirements when tested in accordance with the specified test methods:

Property	Specification		Test Method (1)
General:	Min.	Max.	
Density	-	-	Method 2.1
Consistency, KU (2)	85	95	Method 4.5
Skinning Properties (3)	0	0	Method 10.1
Contrast Ratio (5)	0.992		
VOC (6)		150g/L	ASTM D3960

Volatile Matter % (mass)(including water)		24	Method 17.1
Freeze-thaw resistance	Pass		ASTM D2243
Pigment Content, % (mass)	56	62	Method 21.2
Binder solid,% of mass (7)	16.75		Method 19.1
100% Acrylic Polymer, % (mass)	15	-	Method 57.1
No-pick-up time, min. (4)	1	5	ASTM D711
Non-tracking time, sec. (9)		60	
Fineness of grind, HU	3	-	ASTM D1210
Coarse Particles:			
#60 Sieve – 250um	nil	nil	ASTM D185 & ASTM D2205
#100 Sieve – 150 mm	-	0.01	
Bleeding	4	-	ASTM D868 & ASTM D2205
Settling Rate	6	-	ASTM D1309
	8	-	ASTM D869
White Paint:			
Titanium Dioxide, g/L	150	-	Method 2.1, 21.1, 50.14
Titanium Dioxide Pigment (8)			
Reflectance	80	-	ASTM E97
Colour	-	-	1-GP-12C 513-301
Yellow Paint:			
Reflectance	60	-	ASTM E97
Colour	-	-	505-308 (approx)

(1) All tests to be performed by methods as per Canadian General Standards Board (CGSB), 1-GP-71 or American Society of Testing and Materials (ASTM) or as noted herein.
(2) Kreb units at 25°C
(3) Paint shall be non-skinning. (See General Requirements, 2.1.1.2).
(4) Perform field tests on a 15 mil wet film thickness of hot spray (maximum 50°C). Wait one minute, drive a passenger vehicle over the film and ensure no visible (from 15m)

deposition of paint is deposited onto the adjacent pavement.

(5) Contrast Ratio: apply a wet film thickness of 381 microns on Laneta Penopac form (1B) Drying Time: Minimum 24 hours at 23°C. (plus or minus 2°C)

(6) Volatile organic compounds (VOC) (excluding water): max. 150g/L; method ASTM D3960.

(7) Binder shall be FASTRACK Resin XSR or equivalent.

(8) Titanium dioxide pigment shall be Rutile type and have a minimum TiO_2 content of 93%.

(9) Non-tracking time based upon 375um (15 mils) wet film thickness applied when pavement temperature is greater than 10° C and humidity conditions of 80% or less on dry pavement.

2.3 Glass Bead Intermix System

.1 The compound shall be a mixture of glass bead and drying agent materials.

.2 The compound shall meet the following gradation when tested according to ASTM D1214:

Sieve Size	% Passing
1.180mm (#16)	100%
0.850mm (#20)	90 – 100%
0.600mm (#30)	65 – 95%
0.300mm (#50)	10 – 35%
0.150mm (#100)	0 – 5%

.3 The glass bead component of the compound shall be colourless, clean, transparent, and free from milkiness and excessive air bubbles. They shall be spherical in shape, containing no more than 30% irregularly shaped particles and be the equivalent of an AASHTO Type I glass bead. The silica content of the glass spheres shall not be less than 60% as per ASTM C169 testing. The component shall be manufactured of glass of a composition designed to be highly resistant to traffic wear,

decomposition, etching under atmospheric conditions, dilute acids, alkalis, paint film constitutes, and to the effect of weathering, and should be composed of recycled glass (to the maximum extent possible).

.4 The drying agent component shall be smooth and spherically shaped, amber to white in colour, and of a type that promotes accelerated coalescence of the latex polymer and as such reduces water-borne paint dry to touch time by approximately 40% (minimum).

.5 The compound shall show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps. It shall flow freely from dispensing equipment at any time when applying with pavement marking.

PART 3 – EXECUTION

3.1 Equipment Requirements

.1 Paint applicator to be an approved pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.

3.2 Condition of Surfaces

.1 Surface to be dry, free from ponded water, frost, ice, dust, oil, grease and other foreign materials.

3.3 Traffic Control

.1 Traffic control to be in accordance with Section 01 55 26 – Traffic Regulation.

3.4 Application

.1 Unless otherwise approved by Departmental Representative, apply paint only when air Temperature is above 10°C, wind speed is less than 60km/h and no rain is forecast within next 4h.

.2 Apply traffic paint evenly at rate of 3m/L.

.3 Do not thin paint unless approved by Departmental Representative.

.4 Symbols and letters to conform to dimensions indicated.

.5 Paint lines to be of uniform colour and density with sharp edges.

.6 Thoroughly clean distributor tanks before refilling with paint of different colour.

3.5 Tolerance

.1 Paint markings to be within plus or minus 12mm of dimensions indicated.

.2 Remove incorrect markings to approval of Departmental Representative.

3.6 Protection of Completed Work

.1 Protect pavement markings until dry.

END

PART 1 – GENERAL

1.1 Summary

.1 Related Sections:
- .1 Section 01 33 00 – Submittal Procedures.

1.2 References

.1 American Water Works Association (AWWA)
- .1 AWWA A100-06, Standard for Water Wells.
- .2 AWWA C200-05, Standard for Water Pipe, 6 Inch (150 mm) and Larger.
- .3 AWWA C654-03, Standard for Disinfection of Wells.

.2 American Society for Mechanical Engineers (ASME)

.3 ASTM International
- .1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .2 ASTM F480-06e1, Standard Specification for Thermoplastic Water Wall Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80.

.4 American Water Works Association (AWWA)
- .1 AWWA A100-06, AWWA Standard for Water Wells.
- .2 ANSI/AWWA D100-11, AWWA Standard for Welded Steel Tanks for Water Storage.
- .3 ANSI/AWWA D102-11, AWWA Standard for Coating Steel Water-Storage Tanks.
- .4 AWWA D103-09, AWWA Standard for Factory-Coated Bolted Steel Tanks for Water Storage.

.5 CSA International
- .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium (Consists of B137.0, B137.1, B137.2, B137.3, B137.3.1, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).

.6 National Electrical Manufacturers Association (NEMA)

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for (well pump, riser pipe, pitless adaptor, well cap, etc.) and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on drawings:

.1 Equipment including connections, piping, and fittings, strainers, control assemblies and ancillaries, identifying factory and field assembled.

.2 Certified performance and efficiency pump curves.

.3 Wiring as assembled and schematically.

.4 Dimensions, construction details and recommended installation.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for well pumps for incorporation into manual.

.1 Include:

.1 Manufacturer's name, type, model year, capacity and serial number.

.2 Details on operation, servicing and maintenance.

.3 Recommended spare parts list and addresses of representatives.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations.
- .2 Store and protect well pumps from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove of pallets, crates, padding, and packaging materials for disposal.

PART 2 - PRODUCTS

2.1 General

.1 Well pump system: to include well pump, riser pipe, pitless adaptor, well cap and accessories.

2.2 Well Pumps and Accessories

.1 As shown on the drawings, the Contractor will be responsible for the construction of a residential water type potable well, with the following characteristics:

- .1 Casing: Welded steel casing, 150mm dia.
- .2 Pitless Adaptor: Weld-On Mass-Midwest Model J or approved equal;
- .3 Well Cap: Aluminum Lockable Boshart Industries WTCL or approved equal;.
- .4 Pump: Grundfos SP Model 85S50-4 or approved equal;
- .5 Pump Warranty: 5 years parts and labor;
- .6 Pressure tank: Amtrol WX-252 or approved equal;
- .7 Pump control pressure switch: Square-D or approved equal;
- .8 Operating pressure range: 30 – 50 PSI;
- .9 Pump Discharge Piping (from Pump to Pitless Adaptor): 32mm dia. Polyethylene Pipe, Rated at 160 PSI and CSA B137.1 approved for potable water, IPEX Gold Stripe or approved equal;

.10 Well Pump Depth: Approximately 60m (200 ft). Final depth shall be determined on site by contractor;

.11 Pump Capacity: 1.6 L/s (25 USgpm);

.12 Total Dynamic Head: Pump shall be sized to maintain 50 PSI at the building at the design flow;

.13 Motor: 2 HP, 208 V, 1 PH, 60 Hz.

PART 3 - EXECUTION

3.1 Pump Installation

.1 Install well pump system in accordance with AWWA A100, and local authority having jurisdiction.

.2 Well pump to be installed by a licensed water well Contractor who holds a valid Newfoundland Well Contractor's Permit.

3.2 Pitless Adapter Installation

.1 Installation of pitless adaptor to be performed by a license water well Contractor who holds a valid Newfoundland Well Contractor's Permit.

.2 Well casing above floor to be epoxy coated after installation.

3.3 Electrical Installation

.1 Mount motor control near float switch on well storage tank.

.2 Install disconnect in weatherproof housing as indicated.

.3 Pump cable shall be sized as per the electrical drawings and specifications.

3.3 Piping

.1 Pipe well pump system as indicated and connect to building cold water system.

3.4 Piping

.1 Pipe well pump system as indicated and connect to building cold water system.

3.5 Submersible Pump

.1 Connect to plastic discharge pipe with anti-torque arrestor.

.2 Secure pump to well head with nylon safety line sized by pump manufacturer.

3.6 Pressure Tank

.1 Pressure tank shall be installed as shown on drawings.

3.7 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 14 13 - Soil Stripping and Stockpiling.

.2 Section 31 23 33 - Excavating, Trenching and Backfilling.

1.2 References

.1 Agriculture and Agri-Food Canada
- .1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment
- .1 PN1340-2005, Guidelines for Compost Quality.

1.3 Action and Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality control submittals:
- .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

1.4 Quality Assurance

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 14 10 – Scheduling and Management of Work.

PART 2 - PRODUCTS

2.1 Topsoil

.1 Topsoil to come from material salvaged on site previously stockpiled on-site or from imported topsoil.
1. Inform Departmental Representative of the proposed source of topsoil and provide access for sampling two (2) weeks minimum before starting production. The Contractor or his representative is to be present during sampling.

.2 Topsoil sources must be free of invasive species and capable of producing clean material to the satisfaction of the Department Representative.

.3 If, in the opinion of Departmental Representative, topsoil from the proposed source does not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that aggregate from a source in question can be processed to meet specified requirements.

.4 Should a change of topsoil source be proposed during work, advise Departmental Representative one (1) week in advance of the proposed change to allow sampling and testing.

.5 Acceptance of the topsoil at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

2.2 Source Quality Control

.1 Contractor is responsible for amendments to supply topsoil as required.

.2 Provide for soil testing by recognized testing facility for PH, P and K, and organic matter.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

3.1 Temporary Erosion and Sedimentation Control

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control drawings.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation

has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.4 No hay mulch or possible seed contaminants are to be used on this project as a part of erosion control or any other activity.

3.2 Stripping of Topsoil

.1 Strip topsoil in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

3.3 Preparation of Existing Grade

.1 Verify that grades are correct.

.2 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.3 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.4 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

3.4 Placing and Spreading of Topsoil/Planting Soil

.1 Screen previously stripped material prior to use using 50mm square screen. Material retained on screen shall be disposed of incidental to the work.

.2 Place topsoil after Departmental Representative has accepted subgrade.

.3 Spread topsoil in uniform layers not exceeding 100 mm.

.4 Spread topsoil as indicated to following minimum depths after settlement.
  .1 50 mm for all areas.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 Finish Grading

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  .1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
  .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.6 Acceptance

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.7 Surplus Material

.1 Dispose of materials not required where directed by Departmental Representative off site.

3.8 Cleaning

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 24 13 - Roadway, Excavation, Embankment and Compaction.

1.2 References

.1 Canadian Food Inspection Agency (CFIA); Plant Production Division, Fertilizer Section:
- .1 Canadian Fertilizer Act and Regulations
- .2 Canadian Fertilizer Quality Assurance Program
- .3 Canadian Fertilizer Act and Regulations

.2 Canadian Nursery Landscape Association (CNLA):
- .1 Canadian Standards for Nursery Stock, Nursery Sod

1.3 Submittals

.1 Product Data.
- .1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Samples:
- .1 Submit:
  - .1 Sod for each type specified. Install approved samples in 1 m^2 mock-ups and maintain in accordance with maintenance requirements during establishment period.
  - .2 Bio-degradable geotextile fabric.
  - .3 0.5 kg container of each type of fertilizer used.
- .2 Obtain approval of samples by Departmental Representative.

.4 Test Reports: Submit certified test reports of seed analyses showing compliance with specified performance characteristics and physical properties.

.5 Certificates: Submit product certificates signed by manufacturer certifying that

materials supplied to the project comply with specified performance characteristics and criteria and physical requirements.

1.4 Quality Assurance

.1 Regulatory Requirements: Use only fertilizers, pesticides, micro-nutrients and supplements that are registered by the Canadian Food Inspection Agency and that meet requirements of referenced acts and regulations.

1.5 Scheduling

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.6 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 11 10 - General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
- .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.3 Storage and Handling Requirements
- .1 Store fertilizer off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 Materials

.1 Number One Grade Turf Grass: Provide sod that is sown and cultivated in local nursery fields as turf grass crop from certified seed as approved by the Departmental Representative, and that has matured under environmental conditions similar to that of the project and as follows:

.1 Turf Grade Sod: Mow sod to a height of 50 mm within 36 hours prior to lifting with clippings removed.

.2 Turf Grass Nursery Sod quality:
- .1 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm
- .2 Mowing height limit: 35 to 65 mm.
- .3 Soil portion of sod: 6 to 15 mm in thickness.

2.2 Accessories

.1 Sod Establishment Support: Provide biodegradable geotextile fabric and pegs as required to prevent washouts and to establish strong root growth.

.2 Water: Provide water from local source or from trucked source as required during maintenance period and until vigorous growth has been established.

.3 Fertilizer: Provide slow release fertilizer that contains a minimum of 65% water insoluble nitrogen, and other nutrients required to establish vigorous growth in proportions necessary to amend topsoil as determined by analysis.

2.3 Source Quality Control

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

.3 Obtain sod only from CNLA listed grower that can provide certification of seed source with growing location in close proximity to project site; provincial associations belonging to CNLA are acceptable for this requirement.

.4 Provide a nutrient analysis of topsoil and provide test data and recommended fertilizer application constituents and rates to Departmental Representative before delivering materials to the project site.

PART 3 – EXECUTION

3.1 Examination

.1 Verify that grades are correct and prepared ready for placement of sodding materials
- .1 Do not perform work under adverse conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Starting work of this Section indicates acceptance of conditions.

3.2 Preparation

.1 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated to tolerance of ±8 mm and to allow surface to drain naturally.

.2 Remove and dispose of weeds, debris, stones larger than 50 mm diameter, soil contaminated by oil, gasoline and other deleterious materials off site and in accordance with requirements of local authority having jurisdiction.

3.3 Installation

.1 Sod Placement:
- .1 Lay sod within 24-hours of being lifted if air temperature exceeds 20°C.
- .2 Lay sod sections in rows with joints staggered and ends butted closely without overlapping or leaving gaps between sections; cut out irregular or thin sections with sharp implements.
- .3 Roll sod as required to obtain close contact between sod and soil using light rolling; use of heavy rolling to correct irregularities in grade is not permitted.

.2 Sod Placement on Slopes:
- .1 Install and secure geotextile fabric in areas having a slope greater than 3:1 to prevent soil erosion in accordance with manufacturer's instructions.
- .2 Lay sod starting from bottom of slopes.
- .3 Peg sod on slopes steeper than 3:1, within 1 metre of catch basins and within 1 metre of drainage channels and ditches to following pattern:

.1 First sod sections along contours of slopes: 100 mm below top edge at 200 mm on centre.
.2 Areas above first sod sections: Not less than 3 to 6 pegs/m2.
.3 Areas at drainage structures Not less than 6 to 9 pegs/m2.
.4 Adjust pattern as required to obtain firm contact with topsoil and to prevent movement.

.2 Drive pegs to 20 mm above soil surface of sod sections.

.3 Fertilizing Program: Fertilize during establishment and warranty periods at a rate and frequency established by source quality control testing and until vigorous growth is established.

.4 Maintenance during Establishment Period: Perform following operations from time of installation until vigorous growth is established:

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm; remove clippings that have potential to smother grassed areas.

.3 Fertilize areas in accordance with fertilizing program listed above; spread half of required amount of fertilizer in one direction and remainder at right angles and water in well where rainfall is not expected within 2 to 3 hours of fertilizing.

.5 Acceptance: Departmental Representative will accept installation provided that:

.1 Sodded areas are properly established and free of bare and dead spots with no surface soil from a height of 1500 mm when grass has been cut to height of 50 mm; when sodded areas are cut a minimum of 2 times prior to acceptance; and that fertilizing in accordance with fertilizer program has been carried out at least

once.

.6 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.4 Maintenance During Warranty Period

.1 Maintenance during Warranty Period: Perform following operations from time of acceptance until end of warranty period:

.1 Water Turf Grade Sod at weekly intervals to obtain optimum soil moisture conditions listed above.

.2 Repair and reapply sod to dead or bare spots before expiration of warranty period.

.3 Cut grass and remove clippings that have potential to smother grass to heights listed above.

.4 Cut grass at 2-week intervals or as otherwise required to maintain grass at correct growing height at intervals so that approximately one third of growth is removed in single cut.

.5 Eliminate weeds by mechanical means to extent acceptable listed above.

3.5 Acceptance

.1 Sodded areas will be accepted by the Departmental Representative provided evidence of growth and that plants are uniformly established.

3.6 Warranty Period

.1 For seeding, 12 months' warranty period is extended to 1 full growing season.

.2 End-of-warranty inspection will be conducted by Departmental Representative.

3.7 Cleaning

.1 Remove surplus materials, rubbish, tools and equipment barriers after completion of work of this Section.

END

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for reinstatement of surfaces, property, and structures damaged or disturbed by operations under this Contract. Work includes but is not limited to reinstatement of paved, gravelled and grassed surfaces; sidewalks, curbs and gutters; and ditches and culverts, except as noted herein.

1.2 Related Sections

.1 Section 31 23 33 – Excavating, Trenching and Backfilling

.2 Section 32 91 19 - Topsoil Placement and Grading.

.3 Section 33 05 16 - Manholes, Catch Basin Structures.

.4 Section 33 11 16 – Site Water Utility Distribution Piping

.5 Section 33 31 13 - Public Sanitary Utility Sewerage Piping.

PART 2 - PRODUCTS

2.1 Materials

.1 Granular materials: to Section 32 11 20.

.2 Asphalt: to Section 32 12 16

.3 Unshrinkable fill: to Section 31 23 33.

.4 Concrete Materials: to Section 03 30 00.

.5 Topsoil: to Section 32 91 19.

.6 0-6mm Crushed Rock:

.1 Composed of clean, hard sound, durable uncoated particles that do not contain friable, soluble or reactive mineral, free of clay,

organic, frozen lumps or other deleterious materials or conditions that would make the crushed rock prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the work.

.2 The source and quality of the crushed rock material shall be as approved by the Departmental Representative.

PART 3 - EXECUTION

3.1 General

.1 Reinstate all surfaces to lines, elevations, and dimensions which existed prior to construction and to match abutting surfaces.

.2 Make good all damage or disturbances to surfaces, survey markers, properties and structures disturbed during construction.

.3 Conduct and confine all construction operations within the limits of the work as shown on the Drawings or as laid out by the Department Representative.

.4 Fully restore the entire site and all properties, facilities, structures, fences, shrubs, lawns, trees, signs, driveways, sidewalks, ditches, culverts, appurtenances, etc. affected by the work to original or better condition before issuance of the "Certificate of Final Acceptance".

3.2 Gravel Surfaces

.1 Place, spread, and fine grade Granular Base to minimum compacted thickness of 150 mm for shoulders and other gravel surfaces. Compact to 100 % Standard Proctor Density.

3.3 Gravel/Crushed Stone Driveways

.1 Existing crushed rock driveways and gravel campsites shall be restored to a depth of 150 mm with approved Crushed Rock material. Crushed rock for driveway restoration shall be Class "A" (19 mm minus) (unless otherwise directed), but in all cases driveway restoration materials must match as closely as possible to the existing driveway materials. This work shall include any excavation and removal of materials to prepare the subgrade and produce a smooth and firm surface on which to place the crushed rock.

3.4 Asphalt Concrete Surfaces

.1 Make vertical saw cut to full depth of asphalt concrete in straight lines. Cut back 300 mm minimum from edge of excavation or beyond to eliminate tension cracks.

.2 Place or remove gravel to depth indicated.

.3 Shape, fine grade and compact gravel surface to 100 % Standard Proctor Density.

.4 Clean contact surfaces and apply tack coat prior to placing asphalt concrete.

.5 Place and compact hot-mix, hot-placed asphalt concrete to Section 32 12 16, and to the following minimum thickness as indicated:
- .1 Asphalt Sidewalk: 50 mm.
- .2 Other surfaces: 75 mm unless indicated otherwise on the drawings.

.6 Asphalt Driveways:
- .1 Restore existing asphalt paved driveways to a depth of 200 mm plus the depth of asphalt.

.2 When repairing existing asphalt driveways, cut the edge of existing asphalt in a straight line to full depth using a cutting saw. Cuts shall be parallel to the road surface unless indicated otherwise by the Department Representative.

.3 In areas requiring paving, sweep clean the surface of the existing asphalt adjacent to the cut.

.4 Complete restoration as soon as possible at each individual property. Make driveways accessible at the end of each day. For existing asphalt driveways, place additional driveway crushed rock as a temporary ramp to the paved area until the asphalt is placed.

.5 Place driveway material in layers not exceeding 200 mm and compact to a minimum of 95% of maximum dry density, as determined by ASTM D698.

.6 Driveway restoration is to result in an edge of the driveway surface which is uniform and matches that of the original driveway. Existing lawns, plantings, fences, etc., shall be protected throughout this work.

3.5 Concrete Walks, Curbs and Gutters

.1 Reinstate concrete walks, curbs and gutters to match pre-construction conditions.

.2 Terminate reinstatement at nearest existing control joint or as indicated.

3.6 Landscaped Surfaces to be reinstated.

.1 Fine grade to smooth surface all areas

.2 Reinstate landscapes to Sections 32 91 19.

3.7 Ditches

.1 Re-establish ditches to provide profiles and drainage that existed prior to construction.

3.8 Culverts

.1 Repair or replace all damaged culverts with new culvert of same material and to lines, elevations, and dimensions as original unless otherwise indicated.

3.9 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 10 00 Concrete Forming and Accessories.

.2 Section 03 20 00 Concrete Reinforcing.

.3 Section 03 30 00 Cast-in-Place Concrete.

.4 Section 31 23 33 - Excavating Trenching and Backfilling.

.5 Section 33 31 13 Public Sanitary Utility Sewerage Piping.

1.2 References

.1 ASTM International

.1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.

.2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM B148-14 Standard Specification for Aluminum-Bronze Sand Castings.

.4 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.7 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

.8 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3(600 kN-m/m3)).

.9 ASTM D1248-12 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

.10 ASTM F593 -13a Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
.11 ASTM F594 -09e1 Standard Specification for Stainless Steel Nuts.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CSA Group
.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
.3 CSA A257, Standards for concrete pipe and manhole sections.
.4 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.5 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for manholes, catch basins, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 It is the Contractor’s responsibility to approve all Shop Drawings and verify their correctness.
.2 Review of the Contractor’s drawings by the Department

Representative shall not relieve the Contractor of the responsibility for the correctness thereof, nor from the results arising from any error or omission in details of design.

.3 Prior to the production of fill concrete for use in this contract, provide to the Department Representative a certificate from a certified testing company stating that the concrete to be supplied conforms to the requirements of this Section.

1.4 Quality Assurance

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.2 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect manholes from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

PART 2 - PRODUCTS

2.1 Materials

.1 Cast-in-place concrete:
- .1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Benching requirements:
  - .1 Benching shall be concrete with a 28 day compressive strength of 25 MPa.
- .3 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.

.2 Concrete Formwork: in accordance with Section 03 10 00 Concrete Forming and Accessories.

.3 Precast manhole units: to ASTM C478M, circular or oval.
- .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
- .2 Precast base sections with reinforced concrete slab within:
  - .1 Rubber gaskets to suit the inlet and outlet pipes and factory installed benching.
  - .2 Install benching to minimize hydraulic losses through chamber.
  - .3 Channels and benching: smooth and uniform and not less than 75% of the diameter of the largest pipe.
  - .4 Approved product: Capital Precast Ltd. or approved equivalent.

.4 Joints between sections: rubber gasket and Ram-Nek gasket as indicated on the

detail drawings and meeting the requirements of the latest CSA A257.3.

.1 Waterproofing membrane as indicated on the detail drawings

.1 Acceptable product: Bakor Blueskin WP 200 complete with Aquatac Primer, Colphene 3000 by Soprema complete with Elastocol Stick Primer or approved equivalent.

.2 Protect membrane with an appropriate "blanket" before being backfilled against.

.5 Adjusting rings: 150 and 300 mm concrete riser sections to ASTM C478M.

.6 Adjusting rings: to ASTM C478M.

.7 Use drop manholes when the difference between the invert elevation of the inlet and the outlet pipe is greater than 600 mm.

.1 Internal drop: pre-cast concrete or RELINER, by RELINER – Duran Inc., complete with drop bowl assembly, PVC DR35 pipe, PVC band and S.S. clamp with maximum spacing of 0.5 m.

.2 Manhole diameter: minimum 1200 mm.

.3 Anchoring systems: in accordance with the drawings.

.8 Drop manhole pipe: same as sewer pipe.

.9 Galvanized iron sheet: approximately 2 mm thick.

.10 Steel gratings, I-beams and fasteners: as indicated.

.11 Frames, covers to dimensions as indicated and following requirements:

.1 Standard manhole frames and covers: 411W cast iron meeting the requirements of the latest ASTM Standard A48, Class 30. Covers: snug fit and rattle free.

.1 Manhole 411W frame outside flange to be 870mm dia., with a 580mm cover opening, and a min. weight of 95.3 kg.

.2 Manhole 411W solid cover to be 575mm dia., with a min. of four ribs, two - 25mm lift holes, and a min. weight of 43.1 kg.

.2 Adjustable manhole frames and covers: Laperle C50 M1 or approved equivalent, meeting the requirements of the latest ASTM Standard A536 for Ductile Iron and ASTM A48, Class 30 for cast iron.

.1 Adjustable manhole frames and covers to have machined seats, anti-rocking bumps, and outside flange dia. of 860mm, a 572m dia. x 24mm thick cover, with a min. weight set of 153 kg.

.3 Standard off-road manhole frames and covers: lock-down type, R12S as manufactured by IMP Group Ltd. or approved equivalent, meeting the requirements of the latest ASTM Standard A-48.

.1 Off-road frame outside flange dia. to be 838mm, secured with 4 – 12mm dia. stainless steel anchors, grouted a min. of 50mm into a 685mm dia. conc. riser.

.2 Off-road cover to be 610 mm dia., secured to frame with 2 pentagon-shaped (5-sided), stainless steel fasteners.

.12 Granular bedding and backfill: in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.

.13 Unshrinkable fill: in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.18 Backfill material: in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.19 Fill Concrete:

.1 Portland cement: to CSA CAN3-A5-M, Type 10 or Type 30 (High Early Strength for winter construction).
.2 Supplementary cementing materials, when permitted: to CSA CAN3-A23.5-M.
.3 Fine and coarse aggregate: to CSA CAN3-A23.1-M. Gradation to conform to Table 1 of the CSA Standard for 10 mm minus.
.4 Mixing water: to CAN3-A23.1-M.
.5 Air-entraining admixtures: to CSA CAN3-A266.1-M.
.6 Mix Design:
.1 Maximum cement content: 25 kg/m3.
.2 Maximum strength at 28 days: 0.40 MPa (measured in accordance with CAN3-A23.2-9C).
.3 Slump: 150-200 mm (measured in accordance with CAN3-A23.2-5C).
.4 Air content: 4% - 6% (measured in accordance with CAN3-A23.2).

.20 Backfill material: in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for manhole installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of the Department Representative.
.2 Inform the Department Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have

been remedied and after receipt of written approval to proceed from the Department Representative.

3.2 Excavation and Backfill

.1 Excavate and backfill in accordance with Section 31 23 33 - Excavating Trenching and Backfilling and as indicated.

3.3 Concrete Work

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Position metal inserts in accordance with dimensions and details as indicated.

3.4 Installation

.1 Construct manholes of pre-cast concrete sections according to drawing details.

.2 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.3 Complete units as pipe laying progresses.

.1 Maximum of 3 units behind point of pipe laying will be allowed.

.4 Install manholes at the locations indicated on the drawings, at all changes in grade, pipe size or alignment, at all intersections, at the end of each line and at distances not greater than 120 m for sewer 600 mm nominal diameter and smaller and 150 m for sewers 600 mm nominal diameter and larger. Where possible, manholes in roadways will be located so as to avoid principal wheel travel areas.

.5 Dewater excavation to approval of the Department Representative and remove soft and foreign material before placing concrete base.

.6 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density maximum density to ASTM D698.

.7 Make each successive joint watertight.

.8 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.9 For sewers:
- .1 Place stub outlets and bulkheads at elevations and in positions indicated.
- .2 Bench to provide smooth U-shaped channel.
  - .1 Side height of channel to be 0.75 times full diameter of sewer.
  - .2 Slope adjacent floor at 1 in 20.
  - .3 Curve channels smoothly.
  - .4 Slope invert to establish sewer grade.

.10 Compact granular backfill to 95% corrected maximum dry density maximum density to ASTM D698.

.11 Place unshrinkable backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.12 Installing units in existing systems:
- .1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
- .2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.14 Installing units on new lines where connections are to be made to existing sewer lines:

.1 Install when the downstream systems are ready to receive wastewater.

.2 By-pass flows in the existing sewer around the connection area during construction and testing.

.1 A plug may also be required at the downstream manhole to which wastewater is being pumped, to prevent backflow to the work area.

.3 Test these manholes as they are constructed, before flows are permitted to pass through the new connection.

.4 Whenever bypassing of sewer flow is being carried out, the Contractor shall have personnel on site continuously and back-up system components must be kept on site in the event of a failure of the first system.

.5 Provide plugs or caps where required to block off and seal ends of pipes that are being abandoned or otherwise isolated, incidental to the work.

.15 Set frame and cover on top section to elevation as indicated.

.1 Paved roadways: 10 mm below finished grade and conforming to crown of road.

.2 Gravel roadways: 25 mm below finished grade.

.3 Off traveled roadways: 50 to 100 mm above finished grade.

.1 Include lock-down frame and cover.

.1 Approved product: R12S or approved equivalent.

.4 If adjustment required use concrete ring.

.16 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

3.5 Abandonment or Removal of Manholes

.1 Abandon or remove manholes as indicated on the drawings or as laid out by the Department Representative.

.2 Manholes shall not be abandoned until the remainder of the system is ready to receive wastewater and all required sanitary sewer pipe connections have been completed and accepted.

.3 Remove and dispose of top section(s) above the manhole base unless manhole is to be removed completely to accommodate new piping or connections.

.4 Fill the remainder of the manhole structure with approved granular material.

.5 Backfill the excavation in accordance with Section 31 23 33 Excavating, Trenching and Backfilling.

.1 Match top surface of the fill to surrounding ground and restore surface to match conditions specified for the adjacent areas.

.6 Remove and dispose of surplus materials.

3.6 Field Quality Control

.1 Test all sanitary sewer manholes for leakage.

.2 Notify the Department Representative at least forty-eight (48) hours in advance of performing sanitary manhole ex-filtration tests.

.3 Should the sanitary sewer main ex-filtration tests prove unsatisfactory, the Contractor shall excavate to determine the cause, make repairs, backfill and retest at his own expense.

3.7 Sanitary Manhole Vacuum Test (Air)

.1 To latest version of ASTM C1244M.

.2 Conduct testing one manhole at a time:

.1 Plug all lift holes. Plug all pipe inlets discharging into the test manhole and all pipe outlets discharging from the test manhole. Install a bulkhead on the test manhole.

.2 Use a vacuum pump to increase the negative pressure to 27.6 KPa (4.0 psi). Close the vacuum source. Begin recording of the test time. Allow the negative pressure to increase to 24.1 KPa (3.5 psi).

.3 **Department Representative** will calculate the allowable leakage and notify the Contractor. If the actual leakage time is greater than the allowable leakage time, the test section is acceptable.

3.8 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.9 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair Damage to adjacent materials

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 16 – Rock Removal

.2 Section 31 23 33 – Excavation, Trenching, and Backfilling

.3 Section 35 42 19 – Preservation of Water Courses and Wetlands

1.2 References

.1 American National Standards Institute / American Water Works Association (ANSI/AWWA)

- .1 ANSI/AWWA C110/A21.10-08, American National Standard for Ductile-Iron and Gray Iron Fittings for Water.
- .2 ANSI/AWWA C153/A21.53-11, Standard for Ductile-Iron Compact Fittings.
- .3 ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Service.
- .4 ANSI/AWWA C651-14, Standard for Disinfecting Water Mains.
- .5 ANSI/AWWA C509-09, Resilient-seated Gate Valve for Water Supply Service.
- .6 ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.
- .7 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.
- .8 ANSI/AWWA C904-06, Cross-linked Polyethylene (PEX) Pressure Pipe ½ in (12mm) through 3 in (76mm), for Water Service.
- .9 ANSI/AWWA B301-10, Standard for Liquid Chlorine

.2 ASTM International

- .1 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .2 ASTM D2657-07, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
- .3 ASTM F714-10, Standard Specification

for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-34.1-94, Pipe, Asbestos Cement, Pressure.
- .2 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.

.4 CSA International
- .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
- .2 CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
- .3 CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
- .4 CAN/CSA-B137.5-09, Crosslinked polyethylense (PEX) tubing systems for pressure applications.

.5 Newfoundland and Labrador Department of Transportation and Works.
- .1 Specifications Book (latest edition).

1.3 Submittals

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality control: in accordance with Section 01 45 00 – Testing and Quality Control:
- .1 Submit to Departmental Representative testing results and reports as described in Part 3 of this section.

.3 Preconstruction Submittals:
- .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source(s) of fill materials and provide access for sampling.

.5 Closeout Submittals:
- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of fire hose boxes, stand pipes, air and vacuum release valves. Include top of pipe, horizontal location of fittings and type, valves, valve boxes, and valve chambers.
- .3 Provide a marked up set of drawings to show any changes to the contract drawings which include but are not limited to vertical and horizontal changes to the pipe alignment, location of fire hose boxes, stand pipes, gate valves, air valves and chambers, clearing limits, road limits and erosion control.
- .4 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes,and valve chambers for incorporation into operation and maintenance manual.

1.4 Quality Assurance

.1 For design of any temporary structures submit design and supporting data at least 2 weeks prior to installation or construction.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional Engineer who is registered or licensed in Province of Newfoundland and Labrador, Canada in which Work is to be carried out to design and inspect shoring, bracing and underpinning required for Work.

1.5 Delivery, Storage, and Handling

.1 Deliver, store and handle materials in accordance with manufacturer’s written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect water distribution piping from damage such as nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: dispose of all packaging off site in accordance with provincial and federal laws.

1.6 Scheduling of Work

.1 Submit schedule of expected interruptions for approval to the Departmental Representative.

.2 Notify the Departmental Representative a minimum of 24 hours in advance of any interruption in service.

.3 Do not interrupt water service for more than 24 hours unless otherwise authorized.

PART 2 – PRODUCTS

2.1 Pipe, Joints, and Fittings

.1 Pressure Pipe
- .1 Polyvinyl chloride pressure pipe (100mm diameter): to AWWA C900, pressure class 150, DR-18.
- .2 Polyvinyl chloride pressure pipe (main lines < 100mm diameter), pressure class 200, DR-21, or (main lines <= 50mm diameter) can be Cross-Linked Polyethylene (PEX) with a minimum pressure rating of 160psi SDR9, shall meet CSA B137.5, ANSI/AWWA C904-06, and shall be Municipex or approved equal.
- .3 All water pipe (50mm diameter or less) used for water services, fire hose boxes and new installations shall be Cross-Linked Polyethylene (PEX) with a minimum pressure rating of 160psi SDR9, shall meet CSA B137.5, ANSI/AWWA C904-06, and shall be Municipex or approved equal.

.2 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

.3 End-caps: approved pipe up to and including 100 mm diameter is to arrive on site with factory-installed end-caps on both pipe ends and a “tamper evident seal” on the bell end only.
- .1 Tamper-evident seals will display the manufacturer’s name and/or logo. Seals will straddle the cap and/or tape and the pipe. Removal of the cap should render the tamper-evident seal unusable either by breaking the seal off or by leaving a message such as “Void” on the pipe.
- .2 End-caps shall be installed at the factory and will be one of the following:
  - .1 White, clear or black plastic discs or cone shaped plugs fastened with tape.
  - .2 Polyethylene pipe plugs

(manufactured by Taylor Made).

.3 Due to their length and accessibility for field cleaning, end-caps are not required for fittings and valves.

.4 Couplings for watermain 100mm dia and larger: Star Pipe Products, Dresser, Smith-Blair or approved equal with minimum sleeve length of 250 mm. Couplings shall be epoxy coated, ductile iron or steel complete with high strength low alloy steel tee bolts and nuts tightened using a torque wrench to the manufacturer’s specifications, completely wrapped with 8-Mil poly according AWWA C105.

Couplings for watermain smaller than 100mm dia (main line): PVC schedule 80 fittings shall meet the requirements of ASTM D-2467 and CSA B137.3. PVC DR-21 shall meet the requirments of ASTM D-3139 and D-2241 as well as CSA B137.3.

Couplings for PEX pipe shall be compression type fittings that meet the requirements of CSA B137.5.

.5 Cast iron fittings: to ANSI/AWWA C110/A21.10, and for pipe diameters larger than NPS 4 cement mortar lined to ANSI/AWWA C104/A21.4.

.6 PVC/PEX Pressure Fittings:

.1 Any PVC fittings used shall meet CSA B137.3.

.2 Any PEX fitting used shall meet CSA B137.5.

.3 PVC schedule 80 fittings shall meet the requirements of ASTM D-2467.

.4 Stainless steel inserts are to be used on all PEX tubing where compression fittings are used.

.7 Corporation Main Stops: shall be brass and be ball valve type with inlet end have standard corporation threads to

ANSI/AWWA C800 and outlet having copper compression type connection.

.1 Acceptable Products:
- A.Y. MacDonald Mfg. Co.
- Cambridge Brass, Model No.301
- Ford Meter Box Company, Inc.
- Mueller Canada Series B25008

.8 Service Saddles: for PVC water mains (AWWA C900 pipe), a single or double stainless steel strap, cast ductile iron service saddle is required for all service connections. Service saddles shall be supplied with either fusion-bonded epoxy or nylon coating. Service saddles shall be suitable for a minimum working pressure of 1034kPa.

.1 Acceptable Products:
- Robar 2506
- Romac 202NS
- Ford FC202

.2 Acceptale products for saddles (for main pipe size 65mm in dia. or less)
- Robar 2616
- Ford S70 Style A
- Ford S70 Sytle B

.9 Curb stops: shall be brass and shall be ball valve type with both inlet and outlet ends have copper compression type connection. Curb stops shall meet the latest ANSI/AWWA C800 Standard.

.1 Acceptable Product:
- A.Y.MacDonald Mfg. Co.
- Cambridge Brass Model No.202
- Ford Meter Box Company, Inc.
- Mueller Canada Series B25209

.10 Service Adaptors: shall be brass, compression style, to the latest ANSI/AWWA C800 Standard, Mueller Canada Series H-12943, H-15403, or approved equal.

.11 Flushing and testing points: 25mm diameter main stop and saddle (or tee for smaller pipe)shall be installed on both sides of gate valves where flushing points and pressure testing points are required for the new water main with

25mm diameter pipe and curb stop to the surface. They shall include all necessary services saddles, main stops, curb stops, adaptors, and all pipe required to safely test and flush any particular section of water main.

.12 Corrosion Protection:

.1 Bolts: the Contractor shall protect the bolts on all buried mechanical fittings. Bolts shall be protection from corrosion by using 20mm zinc caps. Cor-cap nuts as supplied by Interprovincial Corrosion Control Company Limited, or approved equal.

.2 All iron fittings, joint restraint system components and couplings shall be completely wrapped with 8-mil poly meeting the requirements of the latest AWWA Standard C105

.13 Backflow Preventers:
All backflow preventers shall meet CSA B64.10-11. Backflow preventers shall be Watts Series LF009 Reduced Pressure Zone Assemblies or approved equal.

.14 Vacuum Breakers:
Vacuum breakers on all fire hose fittings shall be Watts Series 800M4QT Anti-Siphon Pressure Vacuum Breakers or approved equal.

.15 Mechanical Joint Restraints:
All pipes 100mm dia and larger shall be restrained at all mechanical joint fittings with appropriate pipe restraint in accordance with ASTM F1674, FM approved, and designed for the use on AWWA C900 PVC pipe.

.1 Acceptable Products:

- Clow 300 C Restrainer
- EBAA IRON Series 2000 PV
- Uni-Flange Series 1300, 1500
- Sigma One-Lok SLC Series
- Star Pipe Products PVC Stargrip Series 4000
- Star Pipe Products PVC Ring Lock Series 3500.
- Tyler Union TUFGrip TGP

.2 Acceptable Products for Ductile Iron Pipe restrainers include (if required):
- EBAA IRON Megalug Series 1100
- Star Pipe Products Stargrip Series 3000
- Sigma One-Lok SLD Series
- Romac Industries RomaGrip
- Tyler Union TUFGrip TGD

.3 Acceptable Products for bell and spigot restrainers (where required):
- Clow Series 350
- EBAA IRON Series 1600 and Series 2800
- Uni-Flange Series 1350 or 1390

2.2 Valves and Valve Boxes

.1 Valves to open counter clockwise.

.2 Gate valves: for 100mm diameter pipe shall be ANSI/AWWA C509, standard iron body epoxy coated, brass mounted wedge valves with non-rising stems, suitable for 1 Pa with mechanical or flanged joints as per the drawings.

.1 Acceptable products:

.1 AVK;

.2 Mueller;

.3 Bibby;

.4 Clow; or approved equal.

.3 Gate Valves: for 65mm and 50mm pipes shall be 2” – 3” A-2362 threaded by threaded model by Mueller Canada, Clow Canada Model 2639 NPT, or approved equal.

.4 Acceptable Products on Cross-linked Polyethylene pipe (PEX) shall be brass curb stop type ball valves with compression connections:
- A.Y. MacDonald Mfg. Co.
- Cambridge Brass, Model No.202
- Ford Meter Box Company, Inc.
- Mueller Canada Series B25209

.5 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic

principle.

.1 Fabricate valves of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2 MPa working pressure.

.2 Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained.

.3 Valve complete with surge check unit.

.4 Ends to be flanged to ANSI/AWWA C110/A21.10.

.5 Acceptable Products:

.1 Apco Valve Model 145C

.2 Val-Matic Model 202C.2

.3 Crispin Valve UL Series Model UL20

.4 Vent-O-Mat Model 050 RBX 2521 or approved equal.

.6 A appropriately sized main stop and saddle shall be installed to isolate the air valve.

.7 Air-Release valves on 100mm or 65mm diameter pipe shall be 25mm diameter. Air-Release valves on pipe smaller than 65mm diameter shall be 20mm diameter.

.6 Cast iron valve/service boxes: bituminous coated screw type or three piece sliding type adjustable over minimum of 450 mm complete with valve operating extension rod, 130 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 1.8 m below cover.

.1 Base to be large round type with minimum diameter of 300 mm.

.2 Top of box to be marked "WATER"/"EAU"

.3 To be installed on all main line valves and service curb stops. Not to be installed on corporation main stops.

.4 Valve boxes shall be 130mm diameter for main line valves and 105mm diameter for service curb stops.

.7 Pressure Reducing Valve & Strainer: Shall be NSF 61 and CSA Certified. The PRV shall be 50mm in diameter and be capable of maintaining a constant downstream pressure of 35psi regardless of varying upstream pressures. It shall also be fully capable of being completely submerged in water.

.1 Reduced Pressure Setpoint: 35psi;
.2 Inlet Pressure Range: 25psi – 75psi;
.3 Body and bell housing shall be made of low lead bronze;
.4 Valve shall have a separate access cover for the plunger;
.5 Valve shall include low lead type bronze "Y" type strainer with 20 mesh stainless steel screen;
.6 Downstream pressure shall be adjustable with bolt on top of valve;
.7 Bell housing and access cap shall be threaded to the body;
.8 The assembly shall be of the balanced piston design and shall reduce pressure in both flow and no-flow conditions;
.9 The assembly shall be accessible for maintenance without having to remove the body from the line;
.10 The Pressure Reducing Valve shall be a Zurn-Wilkins Model 500XLYSBR or approved equal.

2.5 Valve Chambers

.1 Cast-in-place or precast concrete as per Section 03 30 00

.2 See standard detail on contract drawings for all valve chambers.

.3 Valve chamber frames and covers: gray iron castings, minimum tensile strength 200 MPa, with two coats, shop applied, approved asphalt coating with a mass of approximately 215 kg per set.

.4 Design and dimensions as indicated.

.5 Cover to be marked "WATER"/"EAU".

2.6 Fire Hose Boxes

.1 Fire hose boxes shall be constructed of pressure treated timber plywood to the dimensions and specifications shown on the drawings.

.2 Fire hose boxes shall be coated with fiberglass mat and durable gel coat finish and be complete with stainless steel mesh base with maximum 5.5mm openings as shown on the drawings as constructed by GFI Composites Ltd., located in Bay Bulls, Newfoundland.

.3 Water main and fittings including all tees, ball valves, bends, reducers, hose bibs, backflow preventers and vacuum breakers used for fire hose boxes shall meet the requirements mentioned above in Section 2.1, 2.2 and as shown on the drawings.

.4 Hose bibs, backflow preventers, vacuum breakers and fire hose clamps (forestry connections) shall be NSF 61 and CSA approved.

.5 Timber used for Fire Hose Boxes, including framing shall meet the requirements stated in Section 06 40 00 - Architectural Woodwork.

2.7 Water Bottle Filling/Fountain Stations

.1 Water bottle filling stations shall contain a tap for filling water bottles, a fountain as well as an additional fountain for pets.
- .1 Acceptable product shall be Deelat D1779265 Drinking Fountain and Bottle Filling Station with Pet Fountain or approved equal.
- .2 Water Bottle Filling stations shall be forest green in color.

2.8 Pipe Bedding and Surrounding Material

.1 Granular bedding and backfill: in accordance with Section 32 11 25 – Bedding Material and Section 31 23 33 – Excavating, Trenching and Backfilling

2.9 Insulation

.1 Insulation for water mains with less than 1.8m of ground cover shall be rigid, 50mm thick (unless otherwise noted on the drawings, extruded polystyrene foam board. Insultaion shall be installed within the bedding material, 150mm above the top of the pipe. Acceptable products include:
- .1 Styrofoam HI40
- .2 Foamular 400

2.10 Marker Tape

.1 Metal Marker Tape 50mm wide c/w tracer wire
- .1 To carry the message "CAUTION – WATER MAIN BURIED"

.2 Install marker tape 600mm above the top of the pipe.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of the Departmental Representative.

.2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

3.2 Preparation

.1 Clean pipes, fittings, valves and appurtenances of accumulated debris and water before installation.

.2 Inspect materials for defects to approval of the Departmental Representative.

.3 Remove defective materials from site as directed by the Departmental Representative.

3.3 Dewatering

.1 Keep excavations free of water while Work is in progress. Dewatering activities to proceed in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.4 Provide settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.4 Excavation

.1 Excavation, trenching, and backfilling to be done in accordance with Section 31 23 33 – Excavation, Trenching, and Backfilling

.2 Trench alignment as per the drawings or as directed by the Departmental Representative in the event the existing water main differs from what was shown on the drawings.

3.5 Pipe Installation

.1 Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe fittings, etc., shall be carefully lowered into the trench in such a manner as to prevent damage to them. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

.2 All pipe and fittings shall be thoroughly inspected for defects before and after laying. Any defective or damaged pipe or accessory shall be removed from the site and replaced with sound material.

.3 All foreign matter shall be removed from the interior of the pipe before lowering it into the trench. Trenches shall be kept free of water. The pipe shall be installed without earth entering the main. When the work is not in progress trench water and other foreign matter shall be kept out of the pipe by inserting an acceptable test plug or night cap in the end line. If water has accumulated in the trench, the plugs shall remain in place until the trench is de-watered.

.4 Lay pipes to manufacturer's standard instructions and specifications.

.1 Do not use blocks except as specified.

.5 Join pipes in accordance with manufacturer's recommendations.
  .1 Bevel or taper ends of PVC pipe to match fittings.

.6 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.7 Lay pipes on prepared bed, true to line and grade.
  .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  .2 Take up and replace defective pipe.
  .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

.8 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.

.9 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.10 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.11 Position and join pipes with equipment and methods approved by the Departmental Representative.

.12 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.13 Align pipes before jointing.

.14 Glue Schedule 80 PVC joints and associated fittings with appropriate primer and solvent cements according to manufacturer’s recommendations and procedures. Contractor shall ensure that selection of primer & solvent cement be appropriate for outside temperatures during installation.

.15 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.16 Avoid displacing gasket or contaminating with dirt or other foreign material.
- .1 Remove disturbed or contaminated gaskets.
- .2 Clean, lubricate and replace before jointing is attempted again.

.17 Complete each joint before laying next length of pipe.

.18 Minimize deflection after joint has been made.

.19 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.20 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes as shown on the drawings or as otherwise approved by the Departmental Representative.

.21 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.22 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.23 Do not lay pipe on frozen bedding.

.24 Do hydrostatic and leakage test and have results approved by the Departmental Representative before surrounding and covering joints and fittings with granular material.

.25 Backfill remainder of trench.

.26 The Contractor shall, at his own expense, permanently provide for and maintain the flow of all sewers, drains, and all watercourses, which may be encountered during the progress of the work.

.27 The Contractor shall not allow the contents or any sewer, drain, to flow into the trench; and shall, at his own expense, immediately remove from the proximity of the work all offensive matter using such precautions as necessary or may be directed by the Departmental Representative.

.28 The pipe shall be laid to the grade as indicated on the drawings. Deviations from these grades shall be permitted only upon written approval by the Departmental Representative. The pipe shall be laid with no reverse grades, humps or sags not indicated on the drawings.

.29 Pipe shall be laid with bell ends facing in the direction of laying unless directed otherwise. If it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstruction or to plumb valve stems, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by the pipe manufacturer for the particular size and type of piping being laid. During installation, care must be taken to avoid over-insertion into the pipe bell beyond the spigot insertion line – it must still be visible when pipes are installed.

.30 Mechanical joint connections and tightening and torqueing of bolts shall be in accordance with the manufacturer's instructions and recognized good practice.

.31 Mechanical connections of all tees, bends, valves and fittings shall shall be completely wrapped with 8-Mil poly according AWWA C105.

.32 All tees, bends, valves and fittings on water mains shall be provided with mechanical joint restraints. Refer to drawings for minimum distance of restraining joints.

.33 Expose existing pipe where crossings or connections with the new water main are shown on the drawings. This shall occur prior to installing the new water main. Record the elevation and location of the existing water main by using a surveyor which shall be used to verify or correct the new alignment prior to installing the new pipe in these areas.

3.6 Valve Installation

.1 Install valves to manufacturer's recommendations at locations as indicated.

.2 Valves shall be properly joined to the mains with mechanical joint connections according to the requirements of the manufacturer and recognized good practice. The valves shall be set so that the valve stems are vertical and plumb.

.3 Valves will be installed level. The base of the valve box shall be set so as not to transmit stress to the valve and shall be accurately centered over the wrench nut of the valve, with the valve box set plumb. Valve box can also be set on top of the valve using a rubber valve box adaptor to prevent transmission of road shocks and keep the valve box in a vertical position.

.4 The valve box must be set and maintained in a vertical position over the operating nut and must be properly supported in place with the cover flush with finished grade. Drainage from the valve box will be provided by placing crushed rock around the valve. Covers on valve boxes shall be set flush with the finish grade.

.5 Covers on valve boxes shall be set flush with the finish grade on paved roadways. On gravel roadways, the valve boxes shall be screwed down 100 mm after final inspection.

.6 Pressure Reducing Valve: the pressure reducing valve shall be installed within 1500mm valve chamber as shown on the drawing. It shall be installed in the proper direction complete with a strainer, ball valve for isolation, necessary fittings and couplings for the complete removal of the PRV at the end of each season to avoid ice damage. for the PVC pipe to provided threaded NPT fittings at the inlet and outside sides of the valve.

3.7 Valve Chambers

.1 Cast-in-place or pre-cast sections to be built as shown on the contract drawings or as approved by the Departmental Representative.

.2 Construct units as indicated, plumb and centered over valve nut, true to alignment and grade, and not resting on pipe.

.3 Set bottom section on cast-in-place or pre-cast concrete chamber pads as shown on the drawings.

.4 Place frame and cover on top of cast-in-place or precast concrete to elevation indicated. If adjustment is required use rubber ring(s).

.5 Clean valve chambers of debris and

foreign materials; remove fins and sharp projections.

3.8 Fire Hose Boxes and Service Standpipes

.1 Install fire hose boxes and standpipes at locations indicated on the drawings.

.2 Water mains, tees, bends, valves, reducers, hose connections, air bleeds, hose bib, backflow preventers and vacuum breakers shall be installed as shown on the drawings. Pipes will need to bend vertically up to the fire hose box and standpipes as shown on the drawings.

.3 Fire hose box and standpipes shall be installed in locations a minimum of 2m away from the roadway in a location to be approved by the Departmental Representative.

.4 Underground isolation ball valve for the fire hose box and service stand pipe shall be at 1.2m away from the front of the fire hose box and service standpipe. Another isolation ball valve shall be off the tee toward the HDPE infiltration chamber as shown on the drawing. Isolation ball valve shall be 0.3m away from the HDPE infiltration chamber. The HDPE infiltration chamber shall have 5-19mm Crushed Rock (Clear Stone) in the bottom for 150mm minimum thickness.

.5 Fire hose boxes shall be set plumb.

.6 The fire hose boxes shall be complete with wire mesh base (max. 5.5mm opening) in case any spills occur within and to prevent rodents from entering.

3.9 Restrained Joints

.1 For restrained joints: only use joint restrainers approved by the Departmental Representative.

.2 Refer to drawings for minimum distance of restrained joints from tees, bends, valves and dead ends.

.3 PVC DR-18 pipe joints requiring restraints shall be with mechanical restrainer.

.4 PVC DR-21 pipe joints under 100mm diameter requiring restraints shall be solvent welded joints with Schedule 80 PVC fittings.

3.10 Pipe Surround

.1 Upon completion of pipe laying and after the Departmental Representative has inspected Work in place, surround and cover pipes as indicated.

.2 Pipe surround shall be in accordance with Section 32 11 25 – Bedding Material

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Do not place material in frozen condition.

.6 Compact each layer from pipe invert to mid height of pipe to at least 95% dry maximum density to ASTM D698.

.7 Compact each layer from mid height of pipe to underside of backfill to at least 95% maximum dry density to ASTM D698.

3.11 Insulation

.1 Insulation shall be installed in the locations as shown on the drawings, where the new water main shall have less than 1.8 metres of cover and/or as directed by the Departmental Representative.

.2 Insulation shall be installed 150mm above the pipe in the bedding layer for a width of 1200 mm. The insulation shall be 50 mm thick unless otherwise noted on

the drawings.

.3 Joints between sheets of insulation shall be secured with an appropriate sheeting tape.
.1 Acceptable material: duct tape or approved equal

.4 Insulation shall be covered with a minimum of 150 mm of bedding before backfilling.

3.12 Hydrostatic and Leakage Testing

.1 Do tests in accordance with ANSI/AWWA C600.

.2 Pressure and leakage tests shall be applied to all water mains including service laterals.

.3 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.4 Notify the Departmental Representative at least 48 hours in advance of proposed tests.
.1 Perform tests in the presence of a Departmental Representative.

.5 Where section of system is provided with concrete thrust blocks, conduct tests at least 3 days after placing concrete.

.6 Test pipeline in sections not exceeding 1000 m in length, unless otherwise authorized by a Departmental Representative.

.7 Pressure testing / flushing points shall be 25mm diameter or larger (where possible) to allow sufficient flow to properly flush the line.

.8 Where there is no valve chamber, flushing/testing points shall be excavated to make a connection. 25mm diameter piping shall be extended to the surface complete with Everlock fittings to allow for flushing and testing to be

completed. This piping (if used) is to be removed and saddle/main stop on the main line are to be turned off and capped following flushing and testing. This is considered incidental to the work.

.9 When testing is done during freezing weather, protect valves, joints, and fittings from freezing.

.10 Strut and brace end caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.11 Open all valves prior to testing.

.12 Expel air from main by slowly filling main with water.

.13 Remove stops after satisfactory completion of test and seal holes with plugs.

.14 Thoroughly examine exposed parts and correct for leakage as necessary.

.15 Apply hydrostatic pressure test of 690kPa(100psi) minimum based on the elevation of the lowest point in the main and corrected to the elevation of the test gauge, for a period of 2hrs.

.16 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

.1 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

Repeat hydrostatic test until defects have been corrected.

.17 Define leakage as amount of water required to re-pressurize the pipe to the test pressure at the end of the two (2) hour test.

.18 Before applying the test pressure, all

air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so the air can be expelled, then the corporation stops shall be closed and test pressure applied. The amount of water added shall be measured by a method acceptable to the Departmental Representative. The leakage, as measured by the amount of water added during the test, shall not exceed the amount given by the formula:

$$Q = (L * d * \sqrt{P})/795{,}000$$

Where:

Q = allowable leakage in liters per hour.

L = length of pipe tested, in m

d = nominal diameter of pipe in mm

P = test pressure in kPa

.19 Locate and repair defects if leakage is greater than amount specified.

.20 Repeat test until leakage is within specified allowance for full length of water main.

3.13 Flushing and Disinfecting

.1 Flushing and disinfecting operations: under direct control of Departmental Representative, when the water system is not in operation prior to commissioning in the Spring.

.2 Contractor shall provide disinfection, flushing, testing and dechlorination plan for approval in advance of work being performed.

.3 Notify Departmental Representative at least 10 days in advance of proposed date when disinfecting operations will

begin.

.4 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

.5 Flushing flows as follows:

Pipe Size NPS Minimum	Flow (L/s)
150mm and below	38
200mm	75
250mm	115
300mm	150

.6 Provide connections and pumps for flushing as required.

.7 Open and close valves, hydrants and service connections to ensure thorough flushing.

.8 When flushing has been completed to Departmental Representative's approval, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.

.9 Disinfect water mains as AWWA C651-14 Disinfection Water Mains latest version.

.10 Rate of chlorine application to be proportional to rate of water entering pipe.

.11 Chlorine application to be close to point of filling water main and to occur at same time.

.12 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.13 Flush line to remove chlorine solution after 24 hours.

.14 Measure chlorine residuals at extreme

end of pipe-line being tested.

.15 Take water samples at service connections, in suitable sequence, to test for chlorine residual.

.16 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.

.17 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

.18 Total residual chlorine still present in the water used to disinfect the water main shall be reduced to a maximum of one part per million if released to an environment other than a sanitary or combined sewer pipe.

.19 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
- .1 Take samples from three separate locations daily for minimum of two days.
- .2 Samples will be taken by the Contractor with the presence of the Departmental Representative. The Contractor shall notify the Departmental Representative not less than forty-eight hours in advance of readiness to sample.
- .3 Should contamination remain or recur during this period, repeat disinfecting procedure.

3.14 Surface Restoration

.1 After installing and backfilling over water mains, restore surface to final elevation as shown on the drawings or directed by the Departmental Representative.

END

PART 1 - GENERAL

1.1 Summary

.1 Design, furnish, erect, and test a ground level, cathodic protected, factory coated bolted steel standpipe reservoir. The reservoir is to include a concrete foundation, covered tank structure, internal and external stainless steel piping, mixing system and appurtenances. The tank structure is to include a glass-coated bolted steel floor. The reservoir is to meet or exceed the requirements of AWWA D103 and NBCC (latest revisions).

.2 Provide all materials, labour, equipment, design, construction and testing methods required to complete the work.

.3 All existing local, municipal, provincial and federal government requirements are to govern and this specification shall be interpreted to supplement them.

.4 The owner will provide the required permits, licenses, air space authority approval and easements for the construction of the standpipe and associated works. Obtain and pay for all additional required approvals, licenses and permits of a temporary nature, pertaining to the work, that are required by specific trades.

.5 The bidder shall offer a new tank structure supplied from a manufacturer specializing in the design, fabrication and erection of factory applied internal and external coating, bolt together tank systems. The manufacturer shall own and operate its production plant, fabricate and glass the tank at one location.

1.2 Related Sections

.1 31 23 33 – Excavating, Trenching, Backfilling and Compaction.

.2 33 11 16 – Site Water Utility Distribution Piping.

1.3 References

.1 AWWA D103-09 – AWWA Standard for Factory Bolted Steel Tanks for Water Storage.

.2 AWWA C652-92 – AWWA Standard for Disinfection of Water-Storage Facilities

.3 NBCC – National Building Code of Canada

.4 NSF Standard 61 – National Sanitation Foundation International – Drinking Water System Components.

.5 CAN/CSA A23.3-94, Design of Concrete Structures.

1.4 System Description

.1 Design Requirements:

.1 Tank parameters – refer to Figures for basic elevation view of the standpipe. The following is a breakdown of the minimum requirements:

.1 Inside diameter: 6800mm
.2 Sidewall height: 4700mm
.3 Static freeboard: 600mm
.4 Normal Operating range: 1.2m
.5 Reservoir volume: 125,000L
.6 Floor elevation: Refer to Drawings.
.7 Finish grade elevation: Refer to Drawings.
.8 Original grade elevation: Refer to Drawings.
.9 Engineered mixing valve system as supplied by Tideflex or approved equal.
.10 Rubber check valves for overflow and drain piping as supplied by Tideflex or approved equal.

.2 Tank contents – potable water.

.3 Design standards – conform to the applicable AWWA standards or the NBCC, whichever is the more stringent. Where exception is taken to the above clearly describe the exception, the reason and the consequences of the Bid

Submission.

.4 Foundation design criteria – use the information provided in the Geotechnical Report in Appendix A as the basis for design.

.5 Design loads – use the climate and seismic design data provided in the Geotechnical Report as the basis for design.

.6 The tank plate thickness - no plate shall be less than 3.33 mm

.7 Design the foundation concrete and reinforcing in accordance with CAN/CSA A23.3-94.

.8 Operational criteria: The tank fill flow rate will not exceed 25.0 Lps.

.9 Supplementary requirements – refer to other sections of this specification and the drawings for further information.

.10 All design shall be completed and stamped by registered professional engineers licensed to practice in the Province of Newfoundland and Labrador.

1.5 Submittals

.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Quality Control shall be in accordance with Section 01 45 00 – Quality Control:
.1 Submit to Departmental Representative testing results and reports in accordance with Part 1.5.4 of this section.

.3 Pre-construction Submittals.
.1 Submit construction equipment list for major equipment to be used in this section prior to the start of work.
.2 The following shall be submitted by the successful Contractor within 2 weeks of contract award:
.1 Detailed descriptions of any

proposed equals or exceptions to the specification.

.2 Complete description of the standpipe including diameter, shell height, type of bottom, type of roof, type of coatings, details of bolted joint as well as type and size of plates, members and anchorages.

.3 Listing and description of requested accessories and additional features included with the standpipe.

.4 Certification that the tank will be erected so as to provide electrical continuity of all components in contact with the water.

.5 Warranties, guarantees and supportive information.

.6 The tank supplier shall submit a certificate of insurance that the tank and foundation designer carries Engineer's Professional Liability Error's and Omission (E&O) Insurance with a minimum coverage limit of $1,000,000.

.7 Qualifications – submit documentation of the following requirements:

.1 Years of experience in the design and construction of the type of the tank being proposed.

.2 A list of five (5) structures of similar type and of equal or greater size as specified herein, operating satisfactorily for a minimum of five (5) years in Canada. Include names and telephone numbers of references that may be contacted.

.3 A list of similar tanks that have been constructed in the last twelve (12) Months as well as those presently under construction.

.3 The successful Bidder is to submit five (5) copies of the following to the Departmental Representative within in one (1) month of the award:

.1 Schedule.

.2 Complete sets of structural calculations for the foundation system, the tank and the roof, stamped by a registered professional engineer licensed to practice in the Province of Newfoundland and Labrador and co-stamped by a consulting professional structural engineer employed by the tank manufacturer or structural engineer employed on the tank manufacturer's engineering staff.

.3 Complete set of design calculations for accessories.

.4 Tank suppliers shall provide certification that their tanks are designed and manufactured in accordance with AWWA D103-09 and this specification.

.5 Complete sets of specifications and construction drawings.

.6 Shop drawings for tank and accessories.

.4 Post Construction Submittals:

.1 The following shall be submitted to the Department Representative within two (2) months of substantial completion of the new glass-fused-to-steel tank.

.1 Operation and Maintenance Manuals

.2 Shop field quality procedures and test results.

.3 Hydrostatic and disinfection test results.

.4 Cathodic protection information including the following:

.1 Names and addresses of the corrosion specialist and corrosion system constructor.

.2 Completion data of cathodic

protection system.

.3 Record photographs and drawings showing anode composition, configuration and suspension system.

.4 Electrical schematic drawings.

.5 Maintenance manual including rectifier capacity and operating information.

.6 Affidavit of compliance signed by the corrosion specialist and the corrosion system constructor.

.7 Information or availability of service agreements.

.8 Close-out reports and certifications.

.5 Engineered Mixing Valve System:

.1 Design Calculations to illustrate complete mix can be achieved.

.2 Materials of construction.

.3 Pipe constructions and support details.

.4 Location and orientation of orifices.

1.6 Delivery, Storage and Handling

.1 All aspects associated with delivery, storage, and handling, including protection and waste management, are the responsibility and at the expense of the Contractor.

.2 The tank supplier shall visit the site prior to delivering the tank materials to ensure the site is accessible for all transportation services.

1.7 Project/ Site Conditions

.1 Clearing and grubbing of the site to the extent indicated on the drawings is included in the contract.

.2 Excavation, backfill, earthwork and concrete foundation construction for the water reservoir is included in this contract.

.3 Supply of water required for the construction

of the reservoir shall be provided by the Departmental Representative. Water for testing, disinfection and flushing of the reservoir may be supplied through the water main service connection after the water main is constructed, cleaned and disinfected. The Contractor is forbidden from manipulating existing valves and hydrants. A Departmental Representative will supervise the supply and disposal of test water.

.4 Wastewater may be disposed of on site in a controlled manner that is to meet all regulatory and environmental protection requirements and the approval of the Departmental Representative. Repair all on and off-site damage attributed to wastewater disposal to the approval of the Departmental Representative.

.5 Permanent power for this reservoir may not be installed prior to completion of this work. The Contractor may need to obtain temporary power required during construction for temporary lighting and the operation of power tools from the power supply to the existing pumphouse.

.6 After completion of Work, reinstate the area affected by the Work to original conditions or better in accordance with the requirements of the drawings and specifications.

.7 Completion of the electrical system and the ultrasonic level controller system shall be completed as part of this contract.

PART 2 – PRODUCTS

2.1 General

.1 The tank foundation, tank structure, tank accessories and roof are to conform to the requirements of AWWA D103-09.

.2 The glass-coated bolted steel standpipe shall be either an Aquastore Tank System, Permastore Tanks and Silos, or approved equal.

2.2 Materials .1 Sand

.1 The tank floor shall be constructed on a minimum 75 mm layer of sand, shaped and compacted to the required configuration for the tank bottom. The sand shall be composed of clean, hard, durable, uncoated particles free from lumps of clay, organics or other deleterious materials.

.2 Construction shall be done in accordance with the lines and grades as shown on the drawings, the Specifications, and to the satisfaction of the Engineer.

.3 Prior to the commencement of the work, the Engineer must approve the sand pit and the area in the pit which the Contractor uses as his source of material.

.4 The sand, when tested in accordance with Newfoundland Transportation's method with laboratory sieves, will conform to the following grading limits:

Sieve Size (mm)	Percentage by Weight Passing
9.50	100
6.30	85-100
4.75	80-95
2.36	70-85
1.18	50-75
.600	30-50
.300	10-25
.150	0-15
.075	0-10

.5 The Contractor will be required, at his own cost, to provide the Engineer with a sieve analysis by an acceptable testing organization for the proposed sand, prior to its approval for use and at any time during the construction at the request of the Engineer (at no cost to the Owner).

.6 Sand material shall be placed, graded and compacted to the lines, grades and dimensions shown on the drawings or as directed by the Engineer.

.7 The Contractor will shape the material to the lines and grades provided by the Engineer. All humps, hollows, and depressions will be eliminated during shaping.

.8 Sand layer shall be installed to the required thickness using one (1) lift. When completed, the surface will be smooth, hard, free from ruts, waves, and undulations. The allowable tolerance is 10 mm from the design profile and cross section.

.2 Plates and sheets

.1 Plates and sheets used in the construction of the tank shell, tank floor and tank roof, shall comply with the minimum standards of AWWA D103, latest edition.

.2 Design requirements for mild strength steel shall be ASTM A-1011 Grade 30 with a maximum allowable tensile stress of 15,000 psi.

.3 Design requirements for high strength steel shall be ASTM A-1011 Grade 50 with a maximum allowable tensile stress of 26,000 psi.

.4 The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Sections 3.4 and 3.5.

.5 Laminated panels or multiple layers of panels to achieve the required structural panels' strength will not be acceptable. All sheets shall be a minimum of 3.33 mm.

.6 Rolled Structural Shapes

.7 Material shall conform to minimum standards of ASTM A36 or AISI 1010.

.3 Horizontal Wind Stiffeners
- .1 Design requirements for intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffener, permitting wind loads to distribute around tank.
- .2 Web truss stiffeners shall be of steel with hot dipped galvanized coating.
- .3 Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

.4 Bolt Fasteners
- .1 Bolts used in tank lap joints shall be ½" – 13 UNC-2A rolled thread.
  - .1 SAE Grade 2 (1" bolt length)
    - .1 Tensile Strength – 74,000 psi Min.
    - .2 Proof Load – 55,000 psi Min.
    - .3 Allowable shear stress – 18,163 psi Min.
  - .2 SAE grade 8/ASTM A490 (1.5" – 2/25" bolt length) heat treated to:
    - .1 Tensile strength – 150,000 psi Min.
    - .2 Proof Load – 120,000 psi Min.
    - .3 Allowable shear stress – 36,818psi Min.
  - .3 SAE grade 5/ASTM A325 (1.25" bolt length heat treated to:
    - .1 Tensile Strength – 120,000 psi Min.
    - .2 Proof Load – 85,000 psi Min.
    - .3 Allowable shear stress – 29,454 psi Min.

.5 Bolt Finish – Zinc. Mechanically deposited.
- .1 2.0 Mils Min. – under bolt head, on shank and threads
- .2 Hot dipped galvanized will not be acceptable.

.6 Bolt Head Encapsulation
- .1 High impact polypropylene co-polymer encapsulation of entire bolt head up to the splines on the shank.
- .2 The bolt head encapsulation shall be

certified to meet the ANSI/NSF 61 for indirect additives.

.3 All bolts on the vertical tank wall shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.

.4 All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between tank sheets.

.7 Bolt lengths shall be sized as to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torqueing will not be permitted.

.8 Multiple vertical bolt line sheets and plates of ASTM A-1011 Grade 50 only shall be manufactured such that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate. When these sheets are used, the effective net section area shall not be taken as greater than 85% of the gross area.

.9 All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the shank in order to resist rotation during torqueing.

.1 Portion of bolt on exterior of tank shall also have protective caps.

.10 Sealant

.1 The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with water. The sealant shall be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard 61 for indirect additives.

.2 The sealant shall be used to seal lap joints, bolt connections and edge fillets for sheet notches and starter sheets. The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, low

shrinkage, and be suitable for interior and exterior use. Sealant must be 100 ppm chlorine resistant.

.3 Sealant curing rate at 73F and 50% RH

.1 Tack-free time: 6 to 8 hours

.2 Final cure time: 10 to 12 days

.11 Glassed Coating Specification

.1 Surface Preparation

.1 Following the de-coiling and shearing process, sheets shall be steel grit-blasted on both sides to the equivalent of SSPC-SP10. Sand blasting and chemical pickling of steel sheets is not acceptable.

.2 The surface anchor pattern shall be not less than 1.0 mil.

.3 These sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

.2 Preparation of Sheet Edges

.1 After initial sheet preparation, all full height vertical wall sheets and all rectangular shaped floor sheets shall be machined and a thermal spray coating of stainless steel shall be applied to the exposed sheet edge.

.2 The same glass coating as applied to the sheet surfaces shall be applied to the edges. Mastic or sealer shall not be acceptable as the only means to protect sheet edges from corrosion.

.3 Cleaning

.1 After fabrication and prior to application of the coating system, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying.

.2 Inspection of the sheets shall be made for traces of foreign matter or rust. Any such sheets be re-cleaned or grit-blasted to an acceptable level of quality.

.4 Coating
- .1 All sheets shall receive one coat of a glass pre-coat to both sides and then air dried.
- .2 A second coat to both sides of the sheets, of milled forest green glass, shall be made. The sheets shall be coated in strict accordance with the manufacturer's quality process controls.
- .3 The sheets shall then be fired at minimum temperature of 1500˚F in strict accordance with the manufacturer's quality process control procedures.
- .4 A final cover coat of milled glass shall be applied to the inside of the sheet. This milled glass shall be formulated with titanium dioxide to produce a finished interior with optimum toughness and resistance to conditions normally found in potable water storage tanks. Due to the high concentration of titanium dioxide, the inside of the sheets shall be off-white in colour. The exterior of the sheets shall be forest green.
- .5 The sheets shall then be fired a second time at minimum temperature of 1500˚F in strict accordance with the manufacturer's quality process control procedures.
- .6 The same glass coating as applied to the sheet surfaces shall be applied to the exposed sheet edges.
- .7 Minimum dry coating thickness shall be 10-16 mils.

.5 Factory Inspection
- .1 Coated sheets shall be inspected for mil thickness (Mikrotest of equal).
- .2 Coated sheets shall be checked for colour uniformity by an electronic colorimeter.
- .3 An electrical leak detection test

shall be performed on the inside surface after fabrication of the sheet. Sheets with excessive leaks shall be rejected so as to minimize field touch up.

.6 Packaging

.1 All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.

.2 Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

.3 Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special woods pallets built to the roll-radius of the tank panels to minimize contact or movement of finished panels during shipment.

.4 Shipment from the factory will be by truck, hauling the tank components exclusively.

PART 3 – STRUCTURE, MATERIALS AND ACCESSORIES

3.1 General

.1 The roof shall be either:

.1 A radially sectioned roof fabricated from glassed coated, bolted steel panels, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels utilizing the same sealant and bolting techniques, so as to assure a water/air tight assembly. The roof shall be clear span and self-supporting. Both live and dead loads shall be carried by the tank walls. The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least twenty-four (24”) inches in both

directions. The opening shall have a curb at least four (4”) inches in height, and the cover shall have a downward overlap of at least two (2”) inches, or a gasketed weather-tight cover in lieu of the four (4”) inch curb and two (2”) inch overlap.

.2 **or** an AWWA D108 Structurally supported Aluminum dome roof:

.1 The roof shall be constructed of non-corrugated triangular aluminum panels which are sealed and firmly clamped in an interlocking manner to a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a dome structure. The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring.

.2 The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

.3 Materials shall be per AWWA D108, latest edition standards.

.4 Dome Panels: AA6005A-T6, AA6061-T6 or AA3003-H16.

.5 Fasteners shall be AA2024-T4 aluminum or series 300 stainless steel as required by the manufacturers.

.6 Design Sealant will be silicone, conforming to Federal Specification TT-S-00230.

.7 Gaskets shall be Silicone, conforming to Federal Specification ZZ-R-765, Class 2, Grade 50 or equal, or Neoprene conforming to ASTM C509-00.

.8 An aluminum roof access hatch

shall be provided by the dome manufacturer. The hatch shall be as shown in the specified drawings. The cover shall be equipped with a lift assist device and a hasp for locking.

.9 A properly sized roof vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum liquid level of sufficient capacity so that at maximum design rate of liquid fill or withdrawal, the resulting interior pressure or vacuum will not exceed ½ inch liquid column.

.10 The overflow pipe shall not be considered to be a tank vent.

.11 The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

.12 The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be provided and designed to open should the screen become plugged by frost or debris.

.2 Foundation

.1 The tank foundation is a part of this contract and shall be installed by the tank bidder.

.2 The tank foundation shall be designed by the manufacturer to safely sustain the structure and all live loads.

.3 Tank Floor

.1 The floor design is glass-coated, bolted steel. Bolted steel panels shall be either placed over a three (3”) inch compacted sand base contained by a steel or concrete ring wall, or a non-

extruding and resilient bituminous type filler meeting the requirements of ASTM D175 if set on a concrete slab.

.2 Polyethylene copolymer caps and sealant shall be used to cover the bolts, nuts and washers exposed on the inside of the floor.

.3 Levelling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eight (1/8”) inch, nor exceed one-sixteenth (1/16”) inch within any ten (10’) feet of length.

.4 Only foundation bolts will be exposed exterior of the tank. Exterior angle and fasteners shall not be exposed to the exterior of the tank.

.4 Sidewall Structure

.1 Field erection of the glass-coated, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer’s erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks, using factory trained and certified erectors.

.2 Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

.3 Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected by the Departmental Representative.

.4 An electrical leak test shall be performed during erection using a wet sponge nine (9) volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer’s published touch up procedure.

.5 The placement of sealant on each panel

may be reviewed prior to placement of adjacent panels. However, the Departmental Representative's review shall not relieve the bidder from his responsibility for liquid tightness.

.6 No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

3.2 Tank Accessories and Incidentals

.1 All internal components of the tank, whether in contract with the potable water contents or not, must be certified to meet NSF Standard No. 61.

.2 All accessories and incidentals must also be in full conformity to local codes, current applicable safety regulations, other applicable sections of the specifications and the operational requirements of the structure except as noted. The Bid submission should include extra pricing for additional accessories which may enhance the appearance or usefulness of the structure, however, the base bid is to include for the following accessories and incidentals required to provide a complete working installation in accordance with the drawings and specifications. The drawings indicate the general arrangement and orientation of accessories. The exact positioning required accommodating the manufacturer's fabrication requirements will be confirmed during shop drawing review.

.1 Two (2) grade level shell manways at 180 degree orientation. Opening areas to be equal to or better than an equivalent area for 762 mm diameter.

.2 Inlet/outlet piping conforming to Section 31 11 16 – Site Water Utility Distribution Piping, Valves and Fittings, sizes as shown on the drawings. Install piping to the limits shown on the drawings.

.3 A Ultrasonic Lever Sensor capable of

controlling the start and stop of the existing pumphouse based on the water level in the tank shall be installed as shown on drawings and as per manufacturers recommendations. (Refer to Section 22 05 19 - Meters, Gauges and Instruments)

.4 An external overflow pipe to ground and accessory assemblies designed to withstand the forces resulting from internal ice build-up. The overflow pipe material is to be 304 stainless steel. Terminate the overflow pipe at the bottom with a 90˚ elbow and flapper style valve or other means designed to prevent ingress of insects, birds and animals. Locate outlet a minimum of 2 pipe diameters above finish grade. Provide a splash block with top surface at finish grade as shown on the drawings.

.5 Exterior tank ladder(s) meeting the regulations of the Occupational Health and Safety Act, complete with skid resistant rungs and landings, safety cages, handrails and toe boards. Provide a locking hatch at the bottom of the lower safety cage. Provide access to the roof hatch, vent and beacon.

Construct the ladder with intermediate platforms and offset ladder sections.

.6 Roof opening with minimum size of 610 mm and a positive means to maintain hatch in open position.

.7 Tank vent centrally located on the tank roof. Base the design on full tank flow through an orifice of similar size to tank inlet/outlet pipe at the base of the tank. Screen the vent against insects. Design the vent to operate when frosted over or otherwise clogged or provide a separate pressure-vacuum relief mechanism.

.8 Supply and install a sacrificial anode cathodic protection system in accordance with the tank manufacturer's recommendations for a glass floor, side

wall and roof tank installation.

.9 A manufacturer's nameplate shall list the tank serial number, tank diameter and height, maximum design capacity and date of completion. The nameplate shall be affixed to the tank exterior side wall at a location approximately 1.5 meters from grade elevation in a position of unobstructed view.

3.3 Check Valve Mixing System

.1 Supply

.1 The complete Hydrodynamic Mixing System shall be supplied by the Duckbill Check Valve Manufacturer, or approved equal, to maintain single source responsibility for the system. The complete system shall be defined as all piping and appurtenances within the tank downstream of the tank penetration. Appurtenances include pipe, fittings, horizontal and vertical pipe supports, expansion joints, variable orifice duckbill check valves, and any other equipment specified within this section of the specifications.

.2 Work Included

.1 Inlet/outlet piping conforming to Section 33 11 16 – Site Water Distribution Piping, sizes as shown on the drawings. Install piping to the limits shown on the drawings.

.3 Operation and Maintenance

.1 Provide copies of operation and maintenance data for equipment within four weeks of project completion date.

.2 The manuals shall be in the following format and include the listed required information as a minimum:

.1 Enclosed in a 3-ring binder with project title and system designation shown on the front cover and side binder.

.2 Table of contents with separation tabs.

.3 Copy of hydraulic calculations for the manifold system (as developed by the manufacturer).

.4 Copy of complete set of

installation plans.

.5 Parts and equipment list with specification numbers for ordering of replacement parts.

.6 Product specification sheets for duckbill valves, expansion joints, concrete anchors, and any other specialized items supplied with the system.

.7 Installation guidelines for the manifold system and individual duckbill valves.

.8 Operational procedures for the manifold system.

.9 Guidelines for repair of system components.

.10 Schedule for suggested periodic maintenance of the manifold system.

.4 Inlet Mixing System

.1 Design, supply, install and commission an in-tank inlet mixing system.

.1 Inlet Flow Range: 5.5 to 25.0 L/s

.2 Refer to drawings for tank elevations and dimensions. Normal minimum water level to be 900 mm below top water level.

.3 Pipe manifold to be supported by either the tank wall (for vertical manifold), or the tank floor (for horizontal manifold). Design of supports to be approved by the Engineer and Tank Manufacturer at time of Shop Drawing review.

.2 Design of system to incorporate features to mitigate ice formation in the tank.

.3 Orifice Valves

.1 Orifices to create jet velocities capable of achieving complete mixing of the tank under the design conditions.

.2 Orifice valves to be rubber duck bill style valve, NSF61 approved for use in potable water service.

.3 The valve shall be furnished with stainless steel back-up rings for

installation.

.4 Acceptable Products: Series 35 as manufactured by Tideflex Technologies or approved equal.

.4 Pipe Manifold Riser

.1 Pipe Material: PVC SCH80

.2 PVC pipe and fittings shall conform to AWWA C900/C905 and be NSF61 approved for potable water.

.3 Flanged connection. Flange drilling to ANSI B16.1/B16.5.

.4 Flange gaskets shall be full-faced and shall be in accordance with ASTM D1330. Flange gaskets shall be 1.5 mm thick EPDM for flanges up to 350 mm diameter and 3 mm for flanges over 350 mm.

.5 Support Bracket Assembly: Stainless steel welded or bolted to tank wall according to type of tank construction used. Support brackets shall be supplied and installed by the Tank Manufacturer.

.6 Acceptable System: Tideflex Tank Mixing System or approved equal.

.5 Source Quality Control

.1 Supplier shall have at least fifteen (15) years experience in the manufacture of “duckbill” style elastomeric valves, and shall provide references and a list of installations to the Engineer upon request.

.2 Manufacturer shall have performed hydraulic tests on valves through 48” for flow capacity, headloss, and jet velocity at an accredited flow laboratory. Manufacturer shall provide test data to the Engineer upon request.

.3 Upon request, manufacturer shall provide to the Engineer installation data for existing valves of similar size and type to the project scope.

.6 Installation

.1 Valves shall be installed in accordance with manufacturer’s written Installation and Operation Manual and approved submittals.

.2 Handle and install equipment in strict

accordance with manufacturer's instructions. Ensure such instructions are issued at time of shop drawing issue and are available on site when required.

.3 Provide temporary supports, hoists, and bracing to prevent overloading of the structure while equipment is being installed.

.7 Start-Up and Testing Procedures

.1 Following installation of the complete manifold piping system, the Contractor shall open the upstream isolation valve to allow flow into the tank through the manifold system. The isolation valve must be opened slowly to prevent surge or over-pressurization of the manifold system. The isolation valve must be fully opened to inspect the flow characteristics of the manifold system.

.2 The Contractor shall visually inspect the entire piping system for leakage.

.3 The Contractor shall visually inspect all inlet orifice valves to ensure flow is being discharged into the tank from all valves.

.8 Warranty

.1 All piping, joint connections, expansion joints, and anchors shall be warranted by the duckbill valve manufacturer against failure under design conditions for a period on one (1) year from the date of final installation approval by the Engineer.

.2 Duckbill Valves shall be warranted by the manufacturer against failure under design operating conditions for a period of one (1) year from the date of final installation approval by the Engineer. Elastomer components damaged as a result of maintenance activities, foreign debris, or excessive exposure to direct ultraviolet and thermal radiation shall be excluded warranted coverage.

PART 4 – EXECUTION

4.1 General

.1 Install all products and execute all Work to the requirements of AWWA D103-09 as applicable unless noted otherwise.

.2 All concrete work is to conform to Section 03 30 00 - Cast-In-Place Concrete. Particular concrete specifications to be determined by foundation designer.

.3 Field erection of the bolted steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks. The on-site supervisor shall have installed minimum of five (5) tanks of similar size.

.4 Specialized erection jacks and building equipment shall be used to erect the tanks.

.5 Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually reviewed by the Departmental Representative.

.6 An electrical leak test shall be performed during erection using a nine (9) volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with the manufacturer's published touch-up procedure.

.7 Upon completion of the erection and all testing, the contractor shall provide a letter from the manufacturer certifying that the tank has been assembled and tested in accordance with this specification, the relevant AWWA Standards and the manufacturer's recommendations.

4.2 Erection Tolerances

.1 Plumbness.
  .1 The maximum out-of-plumbness is not to exceed 1/200 of the total height.

.2 Roundness.
  .1 The radius measured at any cross section is not to a tolerance of ± 15 mm.

4.3 Hydrostatic Testing

.1 Test the completed tank for liquid tightness by filling it with clean water to its overflow elevation. Allow water to stand in the completed tank for 24 hours prior to the start of the leak test. Measure and record the water level over the next 24 hours (leak test). Correct all leaks.

.2 Test overflow piping concurrently with leak testing at a rate not to exceed the design flow rate.

.3 Correct all leaks. Repair and re-test until there is zero visible leakage.

.4 Water for testing will be made available by the Owner at no charge. Labour and equipment necessary to fill, test and make repairs is to be included in the Bid Price.

.5 Dispose of test water through the tank drain piping at a controlled rate so as not to adversely affect the environment.

.6 All tests must be conducted in the presence of the Departmental Representative.

.7 Sub-surface inlet and outlet piping is to be tested separately prior to tank erection.

4.4 Disinfection

.1 Disinfect the tank interior and piping to the requirements of AWWA-C652.

.2 Method of disinfection and disposal of chlorinated water reviewed by the Departmental Representative prior to undertaking this work.

.3 Comply with all environmental and health regulatory requirements.

.4 The Contractor is responsible for disposal of chlorinated water in an environmentally sound manner acceptable to the local regulatory authorities. If required, apply reducing agents to maintain chlorine concentration within acceptable limits.

4.5 Field Quality Control

.1 The tank manufacturer's representative is to submit written confirmation that the standpipe has been constructed correctly, successfully tested, disinfected and is ready for continuous operation.

4.6 Extended Warranty

.1 The tank manufacturer shall include an extended warranty for the tank materials and coating.
As a minimum this warranty shall provide assurance against defects in material or workmanship and corrosion of the glass coated surface for the minimum period specified.

.1 Structure: The tank manufacturer shall warrant the liquid storage tank shall be free from any defect in material or workmanship, under normal and proper use, maintenance and operation, during the period of five (5) years from the date of substantial completion of the tank.

.2 Coating: The manufacturer shall warrant the glass coated exterior surfaces and the glass coated interior surfaces of the liquid storage tank will not corrode, chip, crack, spall, or undercut, under normal and proper use, maintenance and operation, during the period of five (5) years from the date of substantial completion of the tank.

4.7 Periodic Inspection

.1 Once every two years, during the extended warranty period, near the anniversary date of substantial completion the manufacturer's authorized dealer shall, at the Owner's request and Owner's cost, make a visual inspection of the tank interior coating and appurtenances; tank exterior coating and appurtenances; cathodic protection system and the immediate area surrounding the tank. A written summary of this inspection will be filed with the tank owner and the tank manufacturer. If, in the opinion of the manufacturer or Departmental Representative repairs are required, the manufacturer shall complete all repairs within six (6) months of being notified.

.2 The cost of emptying the tank to allow internal visual inspections shall be paid by the Owner.

END

PART 1 - GENERAL

1.1 Work Included

.1 This section includes the supply of all labour, materials and equipment and incidentals necessary for the complete installation of all sanitary sewer mains, sanitary sewer laterals and insulation and testing of all sanitary sewer mains as shown on the drawings and herein specified.

1.2 Related Sections

.1 Section 31 23 33 - Excavating, Trenching and Backfilling

.2 Section 32 11 25 – Bedding Material

.2 Section 33 05 16 - Manholes and Catch basin Structures.

1.3 References

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

- .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 ASTM International

- .1 ASTM C12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.
- .2 ASTM C14M-07, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
- .3 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
- .4 ASTM C117-04, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
- .5 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C425-09, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C428-05(2006), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.

.8 ASTM C443M-07, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.9 ASTM C663-98(2008), Standard Specification for Asbestos Cement Storm Drain Pipe.

.10 ASTM C700-09, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.11 ASTM C828-06, Standard Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines.

.12 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft4-lbf/ft3 (600 kN-m/m3)).

.13 ASTM D1869-95(2005)e1, Standard Specification for Rubber Rings for Asbestos Cement Pipe.

.14 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.15 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.16 ASTM D3350-10, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.3 CSA International

.1 CSA A3000-08, Cementitious Materials Compendium.

.2 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.

.3 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings, and Means of Joining.

.4 CSA B1800-11, Thermoplastic Non-pressure Pipe Compendium.
.1 CSA B182.1-11, Plastic Drain and Sewer Pipe and Pipe Fittings.
.2 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.
.3 CSA B182.6-11, Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications.
.4 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.4 Administrative Requirements

.1 Scheduling:
.1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
.3 Notify the Department Representative 24 hours minimum in advance of any interruption in service.

1.5 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
.1 Certification to be marked on pipe.

.4 Test and Evaluation Reports:
.1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.

1.6 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and manufacturer's written instructions.

.2 Load and unload pipe and accessories by lifting with hoists and slings, on pallets, or careful skidding so as to prevent shock and damage.

.3 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.4 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations.
.2 Store and protect pipes and coatings from damage.
.3 Replace defective or damaged materials with new.
.4 Do not drop or drag pipe.
.5 Avoid severe impact blows, abrasion damage, and gouging or cutting of PVC pipe by metal surfaces or rocks.
.6 For pipe handled on skidways, do not skid or roll pipe against pipe already on the ground.
.7 Avoid stressing bell joints and damage of bevel ends.

PART 2 - PRODUCTS

2.1 General

.1 Sanitary sewer pipe and gaskets will be supplied by the Contractor. Sewer pipe gaskets to be supplied to the Contractor by the pipe manufacturer.

.2 Sanitary service lateral pipes, bored pipes, tees, wyes, bends, couplings, rings, fittings, elbows, caps and saddles will be provided by the Contractor.

.3 Joints to be push-on type and must be watertight.

2.2 Plastic Pipe

.1 Type PSM Polyvinyl Chloride (PVC): to CSA B182.2.
- .1 Standard Dimensional Ratio (SDR): 35.
- .2 Gasket to ASTM D3212 and integral bell system with no reduction in the wall thickness.
- .3 Nominal lengths: 6 m.
- .4 Color coded “green”.

2.3 Marker Tape

.1 Metal marker tape:
- .1 50 mm wide, c/w tracer wire.

.2 To carry the message “CAUTION – SEWER MAIN BURIED”

2.4 Service Connections

.1 Type PSM Poly (Vinyl) Chloride: to CSA B182.2.

.2 Plastic pipe and fittings: to ASTM 3034 and CSA B182.1, with push-on joints.
- .1 PVC DR35, colour coded green.
- .2 Minimum 100 mm diameter.
- .3 Joints: bell and spigot type with locked in rubber gasket.

.3 Bends: long radius type only.

.4 Caps for ends of laterals: PVC.

.5 Saddles: PVC gasket and strap on type of the size as indicated on the drawings, meeting the same requirements as the sanitary service pipe. Rubber "Insert-a-tee" or "Kor-n-tee" type connections with stainless steel bands are also accepted.

.6 Bends: long radius type only.

.7 Only PVC tees will be accepted when main sewer pipe has a depth of 3 metres or greater.

.8 Settlement joint: as manufactured by Royal Pipe Systems or approved equivalent.
.1 Required when main sewer pipe has a depth of 3 metres or greater.

2.5 Cement Mortar

.1 Portland cement: to CSA A3000, normal type 10.

.2 Mix mortar 1 part by volume of cement to two parts of clean, sharp sand mixed dry.
.1 Add only sufficient water after mixing to give optimum consistency for placement.
.2 Do not use additives.

2.6 Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer's recommendations.

2.7 Pipe Bedding and Surrounding Material

.1 Granular material to Section 31 23 33 - Excavating, Trenching and Backfilling and Section 32 11 25 – Bedding Material.

2.8 Backfill Material

.1 In accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

2.9 Insulation

.1 Insulation: extruded, expanded closed-cell polystyrene insulation with the following minimum characteristics:
- .1 Compressive strength – 210 kPa;
- .2 Water absorption (% by volume) - Max. 0.7%;
- .3 Capillarity (none);
- .4 Shear strength - 275kPa.

.2 Acceptable Products:
- .1 Styrofoam HI-40, Celfort 300 as manufactured by Owens Corning, or approved equivalent.

2.10 Layout Equipment

.1 In laying out the sewer lines, the Department Representative will establish only the locations and elevations of manholes.

.2 Use approved laser beam instrumentation and techniques to determine intermediate line and grade for all pipes except where and when the Department Representative may allow other methods to be used.
- .1 Install laser beam in the pipe, just above the pipe, or in the bottom of the manhole, unless otherwise approved by the Department Representative.

.3 Use an approved laser sighting triangle or template to set each pipe.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of the Department Representative.
- .2 Inform the Department Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 Preparation

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of the Department Representative.

.2 Clean and dry pipes and fittings before installation.

.3 Obtain **Department Representative**'s approval of pipes and fittings prior to installation.

3.3 Trenching

.1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer or sewer connection.

.3 Trench alignment and depth require approval of the Department Representative prior to placing bedding material and pipe.

3.4 Concrete Bedding and Encasement

.1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
  .1 Place concrete to details as indicated.

.2 Position pipe on concrete blocks to facilitate placing of concrete.
  .1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 hours after placing.

3.5 Granular Bedding

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layers not exceeding 300 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  .1 Do not use blocks when bedding pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material or lean mix concrete mud slab, as indicated on drawings.

3.6 Installation

.1 Install sanitary sewer mains according to the sizes and locations indicated on the drawings.

.2 Provide and use proper implements, tools and facilities for safe and efficient execution of the work.

.3 Lay and join pipes to: ASTM C12.

.4 Lay and join pipes in accordance with manufacturer's recommendations, in accordance with recognized good practice and to approval of the Department Representative.

.5 Handle pipe using methods approved by the Department Representative.
- .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .2 Carefully lower pipe and fittings into trench in such a manner as to prevent damage to them. Do not drop pipe or fittings into trench.

.6 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
- .1 Minimum grade, unless otherwise indicated:
  - .1 Pipe diameter 200 mm to 300 mm: 0.4%
  - .2 Permanent dead-end sewers: 0.6%
- .2 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .3 Remove and re-lay any pipe which is not in true alignment or shows undue settlement after laying.

.7 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.8 Do not lay pipe on a foundation into which frost has penetrated, or at any time when the Department Representative may deem that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

.9 Inspect pipe thoroughly before and after laying. Remove defective or damaged pipe from the site and replace with new sound material.

.10 Trenches where pipe laying is in progress are to be kept dry. Pipes are not to be laid in water or upon wet bedding. Dewater excavations as required.

.11 Thoroughly clean pipes as they are laid and protect pipes from dirt and water.

.12 No length of pipe shall be laid until the preceeding length has been thoroughly bedded and secured in place so as to prevent movement or disturbance of the pipe.

.13 Do not walk on or work over pipes until there is a minimum of 300 mm of cover over them, except as necessary in refilling trench and compacting the bedding material.

.14 Joint deflection permitted within limits recommended by pipe manufacturer.

.15 Water to flow through pipe during construction, only as permitted by the Department Representative.

.16 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.17 Install plastic pipe and fittings in accordance with CSA B182.11.

.18 Pipe jointing:

.1 Install gaskets in accordance with manufacturer's written recommendations.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and

maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and foreign material. Wipe clean ends of pipe, rubber gaskets, fittings, etc. immediately before jointing.

.5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Apply lubricant as approved by the pipe manufacturer to the spigot up to the reference mark and to the face of the gasket (mechanical joint gaskets included).

.7 Complete each joint before laying next length of pipe.

.8 Minimize joint deflection after joint has been made to avoid joint damage.

.1 Joint deflection permitted within limits recommended by pipe manufacturer.

.9 At rigid structures, install pipe joints not more than 1.2 m from side of structure.

.10 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 Pipes may be pushed together by means of a crow-bar solidly wedged into the ground, by using a suitable pipe puller at the joint, or in some instances by very carefully pushing with the backhoe, or by any other method approved by the Department Representative.

.1 Use a block of wood when pushing against the pipe to prevent damage,

.12 Ensure pipe gaskets are not rolled, pinched, dislodged, or torn during jointing.

.19 When stoppage of Work occurs, block pipes as directed by the Department Representative to prevent creep during down time.

.20 Plug lifting holes with pre-fabricated plugs approved by the Department Representative, set in shrinkage compensating grout.

.21 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.22 Make watertight connections to manholes.
- .1 Use shrinkage compensating grout when suitable gaskets are not available.

.23 Connections to existing piping:
- .1 Install new pipes to within 2 m of existing pipe, but do not make connection until all downstream system work is complete and ready to receive wastewater flows.
- .2 Install watertight plug at the end of new pipe to prevent groundwater, dirt or debris from entering the pipe. Obtain survey coordinated of end of the pipe to facilitate the location of the pipe later.
- .3 When the remainder of the system is ready to receive wastewater flows, excavate the end of the new pipe and complete the connection. The Contractor shall as part of the work supply plugs and pumps to by-pass existing flows while the connection is being made. The sewer section and manhole to be leakage tested prior to opening this pipe section to use.
- .4 The Contractor shall be aware that at these connection points it may not be possible for all work to be

done at one time and shall allow for this in pricing the work.

.5 Use prefabricated saddles or field connections approved by the Department Representative, for connecting pipes to existing sewer pipes.

.6 Joints to be structurally sound and watertight.

3.7 Pipe Surround

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after the Department Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.

.7 When field test results are acceptable to the Department Representative, place surround material at pipe joints.

3.8 Insulation

.1 Install insulation in the locations shown on the drawings and as directed by the Department Representative.

.2 Install insulation 50 mm thick at 300 mm above the pipe for a width of 1200 mm.

.3 Level and prepare the surface on which the insulation is to be placed so the insulation is not cracked or broken when backfilled.

.4 Secure joints between sheets of insulation with an appropriate sheeting tape. Acceptable product: duct tape, or approved equivalent.

.5 Cover insulation with a minimum of 150 mm of bedding before backfilling.

3.9 Backfill

.1 Place backfill material in unfrozen condition.

.2 Install marker tape 600 mm above the top of the pipe.

.3 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.4 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.

.1 In other areas, compact to at least 90% maximum density to ASTM D698.

.5 Place unshrinkable fill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

3.10 Service Connections

.1 Install pipe to manufacturer's instructions and specifications.

.2 Maintain grade for 100 and 125 mm diameter sewers at 1 vertical to 50 horizontal unless indicated otherwise.

.3 Install pipe in the locations as staked and according to the sizes as indicated on the Drawings.

.4 Greater depths may be required where existing structures require services and the sewer main permits the greater depth.

.5 Where reconnection of an existing lateral pipe is being completed as part of the work, the existing lateral pipe will be reconnected to the new or existing main section by inserting a new lateral section between the existing lateral and the new or existing main section. This new lateral section will be connected to the existing lateral pipe with an approved coupling (Fernco or equivalent) and to the new or existing main as set out in this Section.

.6 All connections shall be made watertight. Contractor to supply all labour, material including the section of new laterals and equipment necessary for connection of the existing lateral to the existing main.

.7 Marker Tape
- .1 Install marker tape 600 mm above the top of the pipe.

.8 Service connections to main sewer: standard Tee fittings or approved saddles, properly fitted to the sewer main.
- .1 Do not use break-in and mortar patch-type joints.
- .2 Orientation of the connection to be as detailed on the drawings.
- .3 When connecting a saddle, neatly cut the appropriate circular hole with an appropriately sized hole saw, without seriously damaging the pipe. Remove and properly dispose of all material generated by this cutting.

.9 Service connection pipe: not to extend into interior of main sewer.

.10 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
.1 Use long sweep bends where applicable.

.11 Plug service laterals with water tight caps or plugs as approved by the Department Representative.

.12 Place location marker at ends of plugged or capped unconnected sewer lines.
.1 Each marker: 100 x 100 mm stake extending from pipe end at pipe level to 1.0 m above grade.
.2 Paint exposed portion of stake green with designation SAN SWR LINE in black.

3.11 Field Testing

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 When directed by the Department Representative, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

.4 Provide all labour, equipment and materials required to provide leakage tests on sanitary sewer mains and manholes.

.5 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
.1 Where the groundwater table may normally be below the level of the pipeline, test the pipeline using

an air exfiltration method. Where the groundwater table may normally be above the level of the pipeline, test the pipeline using an air infiltration method.

.6 Do infiltration and exfiltration test to ASTM C828.

.7 Do infiltration and exfiltration testing as specified herein and as directed by the Department Representative.
- .1 Perform tests in presence of the Department Representative.
- .2 Notify the Department Representative 48 hours minimum in advance of proposed tests.

.8 Carry out tests on each section of sewer between successive manholes including service connections.

.9 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

.10 Exfiltration test:
- .1 Do exfiltration test to ASTM C969.
- .2 Plug pipe outlets that discharge into the upstream manhole and plug the outlet of the test section at the downstream manhole; the plug in the test section at the upstream manhole shall have a fitting to permit connection of an air hose;
- .3 Using a low-pressure air pump, apply a pressure of 27.6 kPa to the test section;
- .4 Close the valve between the air pump and the test section and allow the pressure to drop to 24.1 kPa and begin recording the test time at this point;
- .5 the Department Representative will calculate the allowable exfiltration. If the actual leakage time is greater than the allowable, the section tested has passed the test.

.6 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.

.7 Immediately prior to test period add water to pipeline until there is head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.

.8 Duration of exfiltration test: 2 hours.

.9 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.

.11 Infiltration test:

.1 Do infiltration tests to ASTM C1618 for concrete pipe and F1417 for PVC pipe testing using low pressure air.

.2 Plug pipe outlets that discharge into the upstream manhole and plug the outlet of the test section at the downstream manhole; the plug in the test section at the upstream manhole shall have a fitting to permit connection of a vacuum hose;

.3 Use a vacuum pump to increase the negative pressure to 27.6 kPa Close the vacuum source and allow the negative pressure to decrease to 24.1 kPa; begin recording of the test time;

.4 the Department Representative will calculate the allowable infiltration; if the actual leakage time is greater than the allowable then the test section is acceptable.

.5 Test all pipe less than 1200 mm in diameter from manhole to manhole. Test all pipe 1200 mm in diameter or greater one joint at a time.

.6 The maximum allowable leakage per joint tested individually shall be that calculated for a 1 metre length of pipe of that diameter at the rate of 0.001 cubic metres per minute square metre of internal pipe surface area.

.7 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.

.8 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.

.9 Install watertight plug at upstream end of pipeline test section.

.10 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at least one third of pipe invert perimeter.

.11 Prevent damage to pipe and bedding material due to flotation and erosion.

.12 Place 90 degrees V-notch weir, or other measuring device approved by the Department Representative in invert of sewer at each manhole.

.13 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.

.12 Infiltration and exfiltration: not to exceed following limits in L per hour per 100 m of pipe, including service connections.

Nominal Pipe diameter	Asbestos-Cement or Plastic pipe	Concrete or Vitrified Clay pipe
(mm)	(L/h/100 m of pipe)	(L/h/100 m pf pipe)
100	3.88	25.5
125	4.62	30.0
150	5.51	34.0
200	7.45	41.5
250	9.39	49.5
300	11.33	56.5
350	13.27	63.5
400	14.91	70.0
450	16.84	76.0
500	18.78	81.5
550	20.72	87.0
600	22.80	92.5
700	26.53	102.0
800	30.11	110.5
900	33.69	118.0
1000	37.56	124.5
1100	41.29	130.0
1200	45.01	135.0

.13 Leakage: not to exceed following limits in litres per hour per 100 m of sewer for diameter tested including service connections:

.1 Exfiltration, based on 600 mm head: 0.175 L.

.2 Infiltration: 0.150 L.

.14 Repair and retest sewer line as required, until test results are within limits specified.

.15 Repair visible leaks regardless of test results.

.16 Television and photographic inspections:

.1 Clean sewers, manholes, and all related appurtenances of all foreign material either by flushing or by hand.

.1 Intercept any debris by installing a basket or other suitable device at the downstream end of the section(s) being flushed

.2 Video inspection is not permitted before or during the flushing operation.

.3 After flushing but before the video inspection begins, add enough water to the upstream manhole so it can be seen flowing at the downstream manhole.

.4 Carry out inspection of installed sewers by passing the video camera through the sewer pipe in the direction of the flow.

.1 One hundred percent (100%) of the sewers will be video inspected.

.5 Provide means of access to permit the Department Representative to do inspections.

.6 The sewer will be inspected for alignment and obstructions. Water ponding in gravity sewers that cannot be eliminated by flushing and cleaning will be considered as evidence of pipe settlement.

.7 Any and all defects such as water ponding, leaking joints, sags, improper grade or alignment, excessive deflection, obstructions, etc. may be cause for rejection and such defects must be repaired by the Contractor at no expense to Parks Canada. the Department Representative shall make the decision if such defects warrant correction.

.8 The Project Inspector shall be present when new sewer is being video inspected.

.9 Details of requirements for closed circuit television inspection are included in Appendix “C”, at the end of these Specifications.

.10 Payment for inspection services in accordance with Measurement and Payment in PART 1.

3.12 Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer's recommendations

3.13 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 Work Included

.1 This section governs the supply of all labour, materials and equipment and incidentals necessary for the complete installation and testing of all sanitary sewer pressure pipes, gate valves, valve boxes, valves and chambers as shown on the drawings and herein specified that are a part of the sanitary pressure pipe system.

1.2 Related Sections

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Section 33 05 16 - Manholes and Catch basin Structures.

1.3 References

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

- .1 ANSI/AWWA C207-07, Standard for Steel Pipe Flanges for Waterworks Service, Sizes 4 Inch Through 144 Inch (100 mm Through 3,600 mm).
- .2 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch Through-12 Inch (100 mm-300 mm), for Water Transmission and Distribution.

.2 ASTM International

- .1 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft3) (600kN-m/m3)).
- .2 ASTM D2241-09, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- .3 ASTM D3034-08, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.

.4 CSA International
.1 CSA B137 Series-09, Thermoplastic Pressure Piping Compendium.

1.4 Administrative Requirements

.1 Scheduling:
.1 Schedule Work to minimize interruptions to existing services.
.2 Submit schedule of expected interruptions and adhere to schedule approved by the Department Representative.
.3 Notify the Department Representative a minimum of 24 hours in advance of interruption in service.

1.5 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit 4 weeks minimum before beginning Work, with proposed source of bedding materials and provide access for sampling.

.4 Certification to be marked on pipe.

.5 Test and Evaluation Reports: submit manufacturer's test data and

certification at least 2 weeks prior to beginning Work.

.6 Manufacturer's Instructions: submit to the Department Representative 1 copy of manufacturer's installation instructions.

1.6 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations.
- .2 Store and protect pipes from damage.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Materials

.1 Polyvinyl chloride (PVC) pipe: to CSA B137 and ANSI/AWWA C900.
- .1 Series 160 SDR: 26, white.
- .2 Pressure Class: 160
- .3 Gasket bell end.
- .4 Pipe joints: bell and spigot with rubber gaskets, solvent welded joints or mechanical joints to ANSI/AWWA C111/A21.11, with transition gaskets to pipe manufacturer’s specifications. This is a push-on joint and must be watertight. The bell will be an integral and homogeneous part of the pipe barrel with no reduction in the wall thickness.

.5 Rubber gaskets: to CSA B137.3 and ASTM D2241 ANSI/AWWA C111/A21.11. Gaskets for mechanical joints to be duck-tipped transition gaskets for PVC.

.2 Polyethylene pressure pipes: to CSA B137:
- .1 Type: DR26.
- .2 Joints:
  - .1 Thermal butt fusion
  - .2 Flanged with steel backing flanges.
  - .3 Flanged with stainless steel backing flanges in marine/submerged areas
- .3 Polyethylene fittings: to CSA B137, for pipe sizes 4" and less.
- .4 Pressure class 350 with cast iron outside diameter and integral bell gasketed joints, to ASTM D2992. Material: to ASTM D2310

.3 Fittings:
- .1 Ductile Iron to AWWA C153, 2415 kPa Class.
- .2 PVC pressure fittings to AWWA C907 and CSA B137.3.
  - .1 Class 160 (DR26) .
  - .2 Push-on bell and spigot type.

.4 Joints:
- .1 Joints for iron fittings: mechanical type, complete with component parts, to latest AWWA Standard C111 for rubber-gasket joints ductile-iron fittings.
- .2 PVC pressure fittings: push-on bell and spigot type, unless otherwise indicated.

.5 Joint Restraints:
- .1 Iron fittings, joint restraint system components and couplings: ductile-iron with high strength low alloy steel tee bolts and nuts tightened using a torque wrench to the manufacturer’s specifications, completely

wrapped with 8-mil poly to AWWA C105.

.2 Mechanical joint restraint for ductile iron fitting: PVC Star Grip 4000 by Star Pipe Products, 2000 PV by EBAA Iron, 1300 S by Uniflange or approved equal.

.3 Mechanical joint restraint for PVC pressure fittings: 1360 S by Uniflange or approved equal.

.4 No extra payment will be made for the supply and installation of joints and fittings restrainers, this shall be considered incidental to the work.

.5 Joint restraint for PVC < 100mm shall be solvent welded joint with Schedule 80 PVC fittings.

.6 Marker Tape:

.1 50 mm wide metal marker tape, covered with tracer wire, carrying the message "CAUTION – FORCE MAIN BURIED"

.7 Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer's recommendations.

2.2 Equipment

.1 In laying out the sewer pressure pipes, the Department Representative will establish only the locations and elevations of discharge locations. The Contractor shall be responsible for all other field layout in accordance with Section 01 00 01 General Requirements.

.2 Utilize laser beam instrumentation and techniques to determine intermediate line and grade for all pipes except where and when the Department Representative may allow other methods to be used.

.3 Approved laser alignment equipment must be used to control line and grade during all laying of pipe. An approved laser sighting triangle or template must be used by the Contractor in setting each pipe.

2.3 Pipe Bedding and Surrounding Material

.1 Granular material to Section 31 05 16 - Aggregate Materials.

2.4 Backfill Material

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Department Representative.

.2 Inform the Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 Preparation

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or

airborne dust to adjacent properties and walkways, according to drawings. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Pipes and fittings to be clean and dry.

.3 Prior to installation, obtain the Department Representative's approval of pipes and fittings.

3.3 Trenching

.1 Do trenching Work, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Trench alignment and depth require approval from the Department Representative prior to placing bedding material or pipe.

3.4 Granular Bedding

.1 Place granular bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.

.6 Fill excavation below design elevation of bottom of specified bedding with common backfill.

3.5 Installation

.1 Load and unload pipe and accessories by lifting with hoists or skidding so as to prevent shock and damage.

.2 Pipe handled on skid-ways will not be skidded or rolled against pipe already on the ground. Pipe will not be dragged along the ground at any time. All material will be handled and stored in accordance with the manufacturer's requirements.

.3 Pipe will be so handled so that any coating will not be damaged. When handling PVC pipe, avoid severe impact blows, abrasion damage and gouging or cutting by metal surfaces or rocks. Avoid stressing bell joints and damage of bevel ends. If, however, any part of the pipe is damaged, the repair will be made by the Contractor in a manner satisfactory to the Department Representative.

.4 Thoroughly inspect pipe in the field before and after placement. Immediately remove any defective or damaged pipe from the site and replace with new sound material at the Contractor's expense.

.5 Lay pipes according to the sizes, types and in the locations as indicated on the drawings in accordance with manufacturer's recommendations and recognized good practice.

.6 Lay pipe with a minimum 2.10 metres cover. The Contractor is responsible for locating this line at the connection points.

.7 Lay pipe in prepared trenches commencing at lowest point with bell of pipe pointing upgrade.

.8 Use proper implements, tools and facilities for safe and efficient execution of the work.

.9 Join pipes in accordance with manufacturer's recommendations. Pipes may be pushed together by means of a crow-bar solidly wedged into the ground, or by using a suitable pipe puller at the joint, or in some instances by very carefully pushing with a backhoe, or by any other method that may be approved by the Department Representative. When pushing against the pipe, a block of wood must be used to prevent any damage to the pipe.

.10 Avoid damage to machined ends of pipes in handling and moving pipe. Do not drop pipe or fittings into trench.

.11 Maintain grade and alignment of pipes.

.12 Align pipes carefully before jointing.

.13 Joint deflection permitted within limits in accordance with pipe manufacturer's written recommendations.

.14 Support pipe firmly over entire length, except for clearance necessary at couplings.

.1 Suitable excavation shall be made to receive the bell, which shall not bear upon the sub-grade or bedding.

.2 Do not use blocks to support pipe.

.15 Lay pipe on dry bedding and keep trench dry during pipe laying.

.16 Keep pipe and pipe joints free from foreign material.

.17 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.

.18 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.19 The ends of the pipe, rubber gaskets, fittings, etc., will be wiped clean immediately before joining the pipes to remove foreign matter from the joints. Apply lubricant to the spigot up to the reference mark and to the face of the gasket (MJ gaskets included).

.20 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

.21 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by the Department Representative.

.22 Remove and re-lay any pipe which is not in alignment or shows undue settlement after laying.

.23 No length of pipe shall be laid until the preceding length has been thoroughly embedded and secured in place so as to prevent any movement or disturbance of the pipe.

.24 When stoppage of Work occurs, block pipe using a watertight plug as directed by the Department Representative to prevent creep during downtime.

.25 No pipe will be laid on a foundation into which frost has penetrated, or at any time when the Department Representative may deem that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

.26 No walking on or working over the pipes after they have been laid will be allowed until there is at least 300 mm of cover

over them, except as may be necessary in refilling the trench and compacting the bedding material.

.27 Mechanical joint connections and tightening and torqueing of bolts shall be in accordance with the manufacturer's instructions and recognized good practice.

.28 Laser beam equipment shall be installed in the pipe, just above the pipe, or in the bottom of the manhole. Installation of the laser beam contrary to the aforementioned shall require approval of the Department Representative.

.29 Install 50 mm wide metal marker tape 600 mm above the top of the pipe, carrying the message "CAUTION – FORCE MAIN BURIED".

3.6 Thrust Blocks

.1 Restrain bends, tees, valves, and fittings using concrete thrust blocks as indicated.

.2 Keep pipe couplings free of concrete.

.3 Bearing area of thrust blocks to be as indicated.

3.7 Pipe Surround

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after the Department Representative has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1 m of pipe.

.4 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.

.5 When field test results are acceptable to the Department Representative, place surround material at pipe joints.

3.8 Backfill

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Compact backfill to at least 95% maximum density to ASTM D698.

.4 Place unshrinkable fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.9 Pipe Penetration Seal

.1 As shown on the Contract Drawings, where cast in rubber gaskets cannot be installed and core drilling is required, suitable pipe penetrations seal is to be installed to ensure that the hole is watertight. All core drilling pipe perforations shall be sealed with Proco Pen-Seal or Link-Seal for a watertight seal. Size of the core drilling holes shall be in accordance with the manufacturer’s recommendations.

3.10 Field Testing of Force Main

.1 Testing of force main to be carried out by Contractor in presence of the Department Representative.

.2 Test after backfilling sections of pipelines as directed by the Department Representative and prior to the placement of roadway base material or surface restoration wherever possible.

.3 Pipeline to be thoroughly flushed before applying the pressure test.

.4 Provide all necessary labour, materials and equipment for the test, including a suitable pump and measuring tank, pressure hoses and connections, plugs, caps, gauges, valves including pressure control valve and all other apparatus necessary for filling the pipe, pumping at the required test pressure, and recording the pressure and leakage losses.

.5 Supply at the Contractor’s expense, a sufficient quantity of water for testing and flushing. Water will not be provided by Parks Canada.

.6 Test pipeline sections not exceeding 350 meters in length unless otherwise permitted by the Department Representative.

.7 Strut and brace caps, bends, tees, valves, and other parts to prevent movement when test pressure is applied.

.8 Expel air from force main, by slowly filling main with water.

.1 If air valves or other means of venting air are not provided, drill and tap high points and install suitable cocks to vent air and to be shut when pressure is applied. Provide a suitable saddle, main stop, valve, corporation stop or approved equal to vent air and which can be shut when pressure is applied.

.2 Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.

.3 This shall be considered incidental to the work.

.9 After completion of the preliminaries described above, apply pressure to the

pipeline using a suitable force pump equipped with a measuring tank.

.10 The test section will normally be subjected to a minimum hydrostatic pressure of 1000 kPa for 2 hours for sanitary pressure pipes but in any case, the test pressure will be limited to 50% above the operating pressure for the pipes in use.

.11 Apply pressure for 1 hour for pressure test and 2 hours for leakage test. Maintain pressure by pumping additional water into the pipe from the measuring tank.

.12 Examine exposed pipe, joints and fittings while system is under pressure.

.13 Remove defective joints, pipe and fittings and replace with new sound material.

.14 Define leakage as amount of water supplied from water storage tank meter in order to maintain test pressure for 2 hours.

.15 Do not exceed allowable leakage as determined by the following formula:

$$L = n * d * \sqrt{P}\ 130{,}000$$

Where:

L = allowable leakage in liters per hour

n = number of joints in section under test

d = nominal diameter of pipe in mm

P = test pressure in kPa

.16 Locate and repair defects if leakage is greater than amount specified.

.17 Repeat test until leakage is within specified allowance for full length of force main.

3.11 Flushing of Force Main

.1 Thoroughly flush all sanitary pressure pipes using adequate volume and pressure to remove all loose material within the pipe.

.2 The Contractor must supply all labour, water, and facilities required to carry out the flushing.

.3 The Contractor must provide a screen or other acceptable apparatus at the lower end of the section being flushed to retain and dispose of all debris flushed from the pipe. The Contractor is responsible for removing any debris not so retained from adjacent sections. Under no circumstances shall dirt be flushed into existing pipes.

.4 The Contractor is to provide his own water incidental to the work as water will not be provided by Parks Canada.

3.12 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 33 – Excavating, Trenching, and Backfilling

Section 32 11 20 – Granular Base

Section 33 36 01 – Advanced Sewage Treatment Units

Section 33 36 33 – Utility Drainage Field

1.2 References

.1 ASTM International
- .1 ASTM C117-[04], Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136-[06], Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-[07e1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3(600 kN-m/m3)).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

.3 CSA International
- .1 CSA A23.1/A23.2-[09], Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CSA A23.4-[09], Precast Concrete-Materials and Construction.
- .3 CSA B66-[10], Design, Material and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks.

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for [utility septic tanks] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Newfoundland, Canada.
- .2 Shop Drawings: to [CSA A23.4].
  - .1 Indicate on drawings:
    - .1 Design calculations for items designed by manufacturer.
    - .2 Tables and bending diagrams of reinforcing steel.
    - .3 Camber.
    - .4 Formwork.
    - .5 Finishing schedules.
    - .6 Methods of handling and erection.
    - .7 Storage facilities.
    - .8 Openings, sleeves, inserts and related reinforcement.

1.4 Quality Assurance

.1 Manufacturers [and erectors] of precast concrete elements are to be certified by CSA as meeting requirements of [CSA A23.4].

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect septic tanks from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Design Requirements

.1 Primary Settling Tank servicing Loop A-B shall have a minimum working capacity of 20,090 litres.

.2 Septic Tank servicing Buildings 24-25 shall have a minimum working capacity of 8,780 litres.

.3 Septic Tank servicing Building 26 shall have a minimum working capacity of 2,300 litres.

.4 Septic Tank servicing Buildings 27-28 shall have a minimum working capacity of 7,100 litres.

.5 Septic Tank servicing Building 38 shall have a minimum working capacity of 12,300 litres.

.6 Septic Tank servicing Buildings 29-30 shall have a minimum working capacity of 10,130 litres.

.7 Septic Tank for new washroom facility at Beach Cove in Malady Head to have minimum total working capacity of 2,300 litres.

.8 Septic Tank at Kitchen Shelter in Malady Head to have minimum total working capacity of 2,300 litres.

.9 Primary Settling Tank at Malady Head Sewer Treatment System to have minimum total working capacity of 10,800 litres.

.10 Septic tanks and primary settling tanks shall meet the following requirements:
1. Minimum liquid level of 1200mm.
2. Inlet and outlet pipes minimum 100mm ø with outlet pipe to be 50mm lower than inlet.
3. Minimum overhead air space of 300mm, or 20% of liquid volume, whichever is greater.
4. Inlet and outlet baffles extending 150mm above liquid level and 300mm (inlet) or 410mm (outlet) below. Open tees can also be used.
5. Minimum soil cover of 300mm.

6. Minimum wall thickness of 150mm.
7. Cannot be located under a driveway, parking lot, or roadway.

2.2 Manufacture .1 Manufacture units in accordance to CSA A23.4.

2.3 Finishes .1 Finish tanks to CSA A23.4, commercial grade.

2.4 Access .1 Include access holes to surface to facilitate cleaning and inspection.

2.5 Tank Bedding and Surrounding Materials .1 Granular material in accordance with Section [31 05 16 - Aggregate Materials] and following requirements:

.1 Crushed or screened stone, gravel or sand.
.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.
.3 Table

Sieve Designation	% Passing
200 mm	–
75 mm	–
50 mm	–
37.5 mm	–
25 mm	–
19 mm	–
12.5 mm	100
9.5 mm	–
4.75 mm	80-100
2.00 mm	50- 90
0.425 mm	10- 50
0.180 mm	–
0.075 mm	0- 10

2.6 Backfill Material .1 As indicated.

.2 Select Backfill Material, in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for utility septic tank installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 Installation

.1 Place bedding and surround material in unfrozen condition.

.2 Do excavation in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

.3 Place tank bedding material in accordance with details as indicated.
- .1 Compact to 95% corrected maximum dry density maximum dry density to ASTM D698.

.4 Make inlet and outlet joints of septic tank watertight, using modular wall seals.

.5 Conduct leakage test on septic tank in presence of Departmental Representative before backfilling.
- .1 Fill tank to level of effluent pipe, and allow to stand for 24 hours.
- .2 Allowable leakage is zero.
- .3 If leakage occurs, remove seal materials and reseal as directed by Departmental Representative

.6 Do backfilling in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .1 Compact to 95% corrected maximum dry density maximum dry density to ASTM D698.

3.3 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 33 36 01 – Utility Septic Tanks

.2 Section 33 36 33 – Utility Drainage Field

1.2 References

.1 NSF / ANSI
- .1 Standard 40 – Residential Onsite Systems

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for advanced sewage treatment systems and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Newfoundland, Canada.
- .2 Shop Drawings: to CSA A23.4.
  - .1 Indicate on drawings:
    - .1 Design calculations for items designed by manufacturer.

1.4 Quality Assurance

.1 Use certified and licensed installers who comply with local authority having jurisdiction.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect septic tanks from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Design Requirements

.1 Total system capacity to be able to handle peak sewage flows as follows:
- .1 Loop A-B: 53,500 L/day.
- .2 Malady Head Sewer Treatment System: 42,000 L/day.

.2 Effluent quality shall not exceed CBOD of 25 mg/L, TSS shall not exceed 25 mg/L on a monthly average basis.

.3 Combined Total footprint of each unit shall not exceed 70 square metres.

.4 Units shall be as follows:
- .1 Loop A-B: Three (3) Fuji Clean CE Series Model CE6KG or approved equal.
- .2 Malady Head Sewer Treatment System: Two (2) Fuji Clean CE Series Model CE6KG or approved equal.

.5 Provide a written performance guarantee indicating that the system will meet the design effluent quality for a period of 5 years from the date of start-up. In the event that the system is not meeting the required effluent quality, the Supplier shall, at his own cost, adjust, modify, or replace the units to bring the system within the design performance parameters. The evaluation of the

system's performance shall be based on samples collected by the Owner's operating and maintenance staff and analyzed for BOD_5 and TSS concentrations.

2.2 Access

.1 Include access holes to surface to facilitate cleaning and inspection.

2.3 Unit Bedding and Surrounding Materials

.1 Granular material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 and CAN/CGSB-8.2.

.3 Table

Sieve Designation	% Passing
200 mm	–
75 mm	–
50 mm	–
37.5 mm	–
25 mm	–
19 mm	–
12.5 mm	100
9.5 mm	–
4.75 mm	80-100
2.00 mm	50- 90
0.425 mm	10- 50
0.180 mm	–
0.075 mm	0- 10

2.4 Backfill Material

.1 As indicated.

.2 Select Backfill Material, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or

Contracts are acceptable for advanced sewage treatment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 Installation

.1 Follow manufacturer’s instructions for base preparation to install units.

.2 Do excavation in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.3 Place bedding and surround material in unfrozen condition.

.4 Place bedding material in accordance with details as indicated.

.1 Compact to 95% maximum dry density to ASTM D698.

.5 Erect and secure formwork for base slab to thickness specified by the manufacturer.

.6 Supply and place rebar for base slab and anti-floatation anchor points as per manufacturer’s instruction.

.7 Pour base slab concrete and allow sufficient curing time as per manufacturer’s requirements prior to installing unit.

.8 Make inlet and outlet joints of advanced sewage treatment unit watertight.

.9 Do backfilling in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.1 Compact to 90% maximum dry density to ASTM D698.

.10 Connect air piping as per the manufacturer's instructions.

.11 Blower units to be housed inside a weatherproof enclosure. Enclosure to be constructed as per the drawings.

.12 Qualified electrician to connect electrical power to blowers as per manufacturer's instructions.

3.3 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 33 – Excavating, Trenching, and Backfilling

.2 Section 32 11 25 – Bedding Material

.3 Section 33 31 13 – Public Sanitary Utility Sewerage Piping.

.4 Section 33 36 00 - Utility Septic Tank

.5 Section 33 36 01 - Advanced Sewage Treatment Units

1.2 References

.1 ASTM International
- .1 ASTM C117-04, Standard Test Method for Material Finer Than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D4318-10, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA International
  - .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
    - .1 CAN/CSA-B137.1-09, Polyethylene Pipe,

Tubing, and Fittings for Cold-Water Pressure Services.

.2 CAN/CSA-B1800-11, Thermoplastic Non-Pressure Piping Compendium. (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CAN/CSA-B182.2-11, PVC Sewer Pipe and Fittings (PSM Type).

1.3 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for drainage field materials and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit 20 kg sample of each granular materials 4 weeks minimum before beginning Work.

.4 Certificates:

.1 Submit copy of certification or licence of approved installers.

.5 Test Reports:

.1 Submit 2 certified copies of factory tests of pipe material.

1.4 Quality Assurance

.1 Use certified and licensed installers who comply with local authority having jurisdiction.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect drainage field materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Granular Materials

.1 Granular material in accordance with Section 31 05 16 - Aggregate Materials and to requirements as follows:
- .1 Pit run crushed or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .3 Table

Sieve Designation	% Passing	
	Treatment Sand	Septic Field Backfill Material
25 mm	–	95-100
19 mm	–	90-100
12.5 mm	–	–
9.5 mm	100	60-100
4.75 mm		35-80
2.36 mm	80-100	15-60
1.18 mm	30-100	–
0.600 mm	15-95	–
0.300 mm	4-15	0-30
0.150 mm	2-8	–
0.075 mm	0-3	0-10

2.2 Imported Filter Material

.1 Sand conforming to requirements of local authority having jurisdiction.

.2 If no such requirements exist, follow sand gradation limits indicated in Section 2.1.1.3

.3 Treatment sand shall meet the following requirements:
 .1 D_{10} (effective size): 0.15mm-0.50mm
 .2 Cu (uniformity): 1.0 to 6.0
 .3 K_{FS} (field saturated hydraulic conductivity): 5E-5 to 6E-4 m/sec

2.3 Concrete Mixes and Materials

.1 Concrete mixes and materials: to CSA A23.1/A23.2.

.2 Use type 1 cement.

.3 Concrete exposure classification: A-3.

2.4 Pipe for Disposal Fields

.1 Effluent piping from septic tanks and advanced treatment units to distribution boxes: Straight PVC pipe and fittings to CAN/CSA-B182.2, unperforated.

.2 Effluent piping within infiltrator chambers: Straight PVC pipe and fittings to CAN/CSA-B182.2, perforated. Perforation pattern to comply with CSA and Nova Scotia Onsite Sewage Disposal Systems Standard.

.3 Vertical piping for infiltrator chamber inspection and ventilation required when field cover is greater than 600mm: Straight PVC pipe and fittings to CAN/CSA-B182.2, unperforated, complete with gooseneck fitting to prevent water and debris from entering infiltrator chambers. Piping to be primed with PVC primer and painted forest green for UV resistance.

2.5 Infiltration Chambers

.1 Infiltration chambers shall be selected as follows:

.1 Infiltrator Systems Quick4 Standard chambers, or approved equal, for burial depths of 900mm or less.

.2 No disposal field installations to exceed burial depth of 900mm.

.3 All infiltration chambers to be fitted with internal 100mm diameter perforated drainage pipe as indicated in section 2.4.2.

.4 All infiltration chambers to be fitted with inspection/ventilation piping only if the field cover is greater than 600mm as indicated in section 2.4.3 and as per manufacturer's recommendations at both end caps of each trench.

2.6 Distribution Box

.1 Distribution boxes shall be pre-cast concrete or as per Section 2.3 above.

.2 All penetrations for connected piping shall be watertight rubber gasket(s) installed by the manufacturer.

.3 Distribution "boxes" can be square, rectangular, or circular as approved by the Departmental Representative.

.4 All pipe penetrations to the distribution box shown on the Drawings shall be at the same elevation and fitted with speed levellers to allow even flow of sewage to each pipe.

.5 Distribution boxes shall have a minimum sump depth of 100mm.

2.7 Dosing Chambers

.1 Shall be precast concrete manholes as per Section 33 05 16 - Manholes and Catch Basin Structures, 1500 mm diameter as shown on the drawings.

.2 Working elevation (drawdown) of dosing device from open to closed positions shall be as follows:
i. Loop A-B: 455 mm, for a total dosing volume of 831 litres.
ii. Building 38: 279 mm, for a total dosing volume of 493 litres.

.3 Chamber to be equipped with a 100mm diameter Flout dosing device as manufactured by Rissy Plastics, or approved equal.
.1 Follow manufacturer's instructions for installation.

.4 Chamber to be equipped with a dosing counter as manufactured by Rissy Plastics, or approved equal.
.1 Follow manufacturer's instructions for installation.

Part 3 - EXECUTION

3.1 Examination

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage field installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of the Department Representative.
.2 Inform the Department Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Department Representative.

3.2 Trench Type Disposal Field and Installation

.1 Excavate to lines and depths as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Scarify trench base and walls parallel to contours under dry conditions.

.3 Operate construction equipment across disposal only after receipt of written approval from the Department Representative.

.4 Place 300 mm minimum sand material as per Section 2.2 in trench bottom.

.5 Install distribution box between septic tank and absorption trenches. Installation to be water-tight construction.

.6 Set distribution box level as indicated.
   .1 Provide access with removable cover for inspection of distribution box.

.7 Connect lengths and place effluent pipe on suitable bedding material as indicated and cover with 150mm minimum of backfill material as specified in section 2.1.1.3.

.8 Connect each effluent pipe individually to distribution box. The first length of each effluent pipe connected to the distribution box shall be set to same grade to ensure even flow. Piping beyond the first length may be graded as required to reach individual absorption trench elevations.

.9 Connect effluent pipes to lower infiltration chamber end caps as indicated.

.10 Cap free ends of perforated pipe in dosed systems.

.11 Orient perforations downward and glue pipe sections together. Grade of perforated pipe inside infiltration chamber shall not exceed 0.5%.

.12 Do not backfill trenches until pipe grade and alignment have been approved by Departmental Representative.

.13 Install vertical piping at each end of infiltrator chamber trench at cutout locations only if depth of field cover is greater than 600mm. Vertical piping to be primed with PVC primer and painted forest green to protect from UV damage.

.14 Backfill trenching with material as indicated.
- .1 Use only material approved in writing by the Department Representative to backfill.
- .2 Do not compact.
- .3 Overfill to allow for settlement.

.15 Follow all manufacturer's installation instructions.

3.3 Area Type Disposal Field and Installation

.1 Prepare disposal field by cutting down vegetation, removing large roots and stone, and scarifying top 50mm of existing topsoil parallel to contours.

.2 Place 300mm minimum thickness layer of sand material as per Section 2.2 for disposal bed under disposal field area.

.3 Place sand material in unfrozen condition as indicated.

.4 Disposal bed fill material (imported filter material) to have characteristics as specified in section 2.2.3 and be pre-approved in writing by Departmental

Representative before delivering to site.

.5 After placement of disposal bed fill, Departmental Representative will conduct 3 on site percolation tests in sand mound before bed construction.

.6 Operate construction equipment across disposal bed only after receipt of written approval from Departmental Representatives

.7 Install distribution box between septic tank and absorption trenches. Installation to be water-tight construction.

.8 Set distribution box level as indicated.
  .1 Provide access with removable cover for inspection of distribution box.

.9 Connect lengths and place effluent pipe on suitable bedding material as indicated and cover with 150mm minimum of suitable backfill material.

.10 Connect each effluent pipe individually to distribution box. The first length of each effluent pipe connected to the distribution box shall be set to same grade to ensure even flow. Piping beyond the first length may be graded as required to reach individual absorption trench elevations.

.11 Connect effluent pipes to lower infiltration chamber end caps as indicated.

.12 Cap free ends of perforated pipe in dosed systems.

.13 Grade of perforated pipe inside infiltration chamber shall not exceed 0.5%.

.14 Do not backfill disposal field until pipe grade and alignment have been approved by Departmental Representative.

.15 Install vertical piping at each end of infiltrator chamber trench at cutout locations only if depth of field cover is greater than 600mm. Vertical piping to be primed with PVC primer and painted forest green to protect from UV damage.

.16 Cover disposal field as indicated.
- .1 Use only material approved in writing by the Department Representative to backfill.
- .2 Do not compact.
- .3 Overfill to allow for settlement.

.17 Grade areas surrounding disposal field bed as indicated, to provide for diversion of surface run off waters.

.18 Follow all manufacturer's installation instructions.

3.1 Cleaning

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END

PART 1 - GENERAL

1.1 Related Sections

.1 Section 31 23 33 – Excavating, Trenching and Backfilling.

.2 Section 31 37 00 – Rip Rap.

1.2 References

.1 ASTM International
.1 ASTM C 117-13, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
.2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
.3 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ftn (600 kN-m/mn)).
.4 ASTM F2306, Standard Specification for 300mm to 1500mm Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity Storm Sewer and Subsurface Drainage Applications.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CSA International
.1 CSA A23.1/A23.3-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
.2 CAN/CSA G401-07, Corrugated Steel Pipe Products.

.4 Government of Newfoundland and Labrador, Municipal Water, Sewer and Roads Master Construction Specification, latest edition.

1.3 Samples

.1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.

.2 Inform Departmental Representative at

least 4 weeks prior to commencing work, of proposed source of bedding materials and provide access for sampling.

1.4 Material Certification

.1 Submit manufacturer's test data and certification at least four weeks prior to commencing work.

.2 Certification to be marked on pipe.

1.5 Delivery, Storage and Handling

.1 Contractor to deliver, store and handle materials in accordance with Product Requirements and manufacturer’s instructions.

1.6 Waste Management and Disposal

.1 Separate and recycle waste materials as indicated by Departmental Representative.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 Culverts: Corrugated HDPE Pipe

.1 All culvert pipe shall be double wall HDPE corrugated pipe with smooth interior as per CAN/CSA B182.8 and ASTM F2306.

.2 All corrugated HDPE culvert pipes shall have water tight joints.

.3 All corrugated HDPE pipe shall be a smooth-lined interior along the entire length of the pipe.

.4 Corrugated HDPE pipe and appurtenances shall conform to CAN/CSA B182.8.

.5 Culvert Design shall be in accordance with the latest editions of CAN/CSA B182.8 for the worst case loading of either 0.7m of

earth fill or finished grade plus 1.0m of earth fill. The live loading shall conform to CAN/CSA – S6-06.

.6 Earth fill material shall have a design density of 21.1kN/m3 and a soil structure interaction factor of 1.15.

2.2 End Treatments

.1 Rip rap: to Section 31 37 00 – Rip Rap and as indicated on the drawings.

2.3 Granular Bedding and Backfill

.1 Granular bedding and backfill material to Section 31 05 16 - Aggregates Materials
.1 Section 32 11 19 – Granular Subbase.

PART 3 - EXECUTION

3.1 Trenching

.1 Do trenching work in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling.

.2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.2 Bedding

.1 Dewater excavation, as necessary, to allow placement of culvert bedding in the dry.

.2 Place minimum thickness of 200 mm of approved granular material on bottom of excavation and compact to minimum 100% maximum density to ASTM D 698.

.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 25% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.

.4 Place bedding in unfrozen condition.

3.3 Laying HDPE Pipe Culverts

.1 Commence pipe placing at downstream end.

.2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.

.3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.

.4 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.

3.4 Joints: HDPE pipe culvert

.1 Joints shall be made with rubber gaskets.

.1 Rubber gasket joints:

.1 Install in accordance with manufacturer's written recommendations.

3.5 Backfilling

.1 Place backfill material, rock borrow approved by Departmental Representative, in 300 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.

.2 Compact each layer to 100% maximum density to ASTM D 698 taking special care to obtain required density under haunches.

.3 Protect installed culvert with minimum 600 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.

3.6 End Treatments

.1 Install rip-rap as indicated or as directed by Departmental Representative.

.2 Obtain approval of Departmental Representative of culvert installation prior to installation of any end treatments.

END

PART 1 GENERAL

1.1 Related Requirements

.1 Section 26 05 43 – Installation of Cables in Trenches and in Ducts.

1.2 References

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No. 211.1-06 Rigid Types EB1 and DB2/ES2 PVC Conduit.

1.3 Action And Informational Submittals

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 Closeout Submittals

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data into manual.

1.5 Delivery, Storage And Handling

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 PVC Ducts And Fittings

.1 Rigid PVC duct: to CSA C22.2 No. 211.1-06 Rigid Type DB2/ES2, with moulded fittings, for direct burial expanded flange ends.

.1 Nominal length: 3 m plus or minus 12 mm.

.2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.

.3 Rigid PVC 90 degrees, 45 degree bends and 5 degrees angle couplings as required.

.4 Expansion joints every 50 m and as required.

.5 Utilization of PVC split ducts is not permitted.

2.2 Solvent Weld Compound

.1 Solvent cement for PVC duct joints.

2.3 Cable Pulling Equipment

.1 6 mm stranded polypropylene pull rope tensile strength 5 kN.

2.4 Markers

.1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

2.5 Warning Tape

.1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW ".

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Installation

.1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Install plastic duct spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.6 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

.8 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.

.9 Install markers as required.

.10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 Cleaning

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END

PART 1 – GENERAL

1.1 Work Included

.1 The work under this section consists of the supply of all labour, materials and equipment and incidentals necessary to complete the installation of protection bollards in accordance with the Drawings.

1.2 Related Sections

.1 Section 03 30 00 – Cast-In-Place Concrete

1.3 References

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM B209-02a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 62-GP-11M-78(R1987), Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing.

1.4 Action and Informational Submittals

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit, in advance of the commencement of the work, the manufacturer’s certification that the materials supplied meet the specified requirements, and the manufacturer’s recommended procedures for installation and instructions for handling.

1.5 Delivery, Storage and Handling

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 Posts

.1 200mm x 200mm pressure treated lumber post with reflector.

PART 3 - EXECUTION

3.1 Installation

.1 Install bollards in accordance with the Specifications and the drawings. Exact location to install the bollards will be determined in the field by the Department Representative.

.2 Install bollards plumb and in a vertical position.

.3 Install and secure bollard covers as per the manufacturer’s recommendations.

.4 Protect bollards from damage during the construction period, and any required repairs will be the Contractor's responsibility throughout the warranty period, at no additional cost to Parks Canada.

3.2 Cleaning

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END

PART 1 – GENERAL

1.1 Related Sections

.1 Section 01 35 43 – Environmental Procedures

.2 Section 33 11 16 – Site Water Utility Distribution Piping

1.2 References

.1 Newfoundland and Labrador Department of Transportation and Works
  .1 Specifications Book (latest edition).

1.3 Environmental Requirements

.1 Operation of construction equipment in water is prohibited.

.2 Use borrow material from watercourse beds only after receipt of written approval from the Department Representative and authority having jurisdiction.

.3 Design and construct temporary crossings to minimize environmental impact to watercourse/wetland.

.4 Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.

.5 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.

PART 2 - PRODUCTS

.1 (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 Existing Conditions

.1 Maintain existing flow pattern in natural watercourse systems.

.2 In natural systems maintain existing riffle pool and step pool patterns.

.3 In wetland systems, maintain existing hydrological conditions.

3.2 Site Clearing and Plant Protection

.1 Temporary Erosion and Sedimentation Control:
  .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to drawings. **Note that hay mulch or any other possible seed contaminant is not permitted on site.**
  .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Minimize disturbance to vegetated buffer zones and protect trees and plants on site and adjacent properties where indicated.

.3 Wrap trees and shrubs adjacent to construction work, storage areas and trucking lanes in burlap.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Leave cuttings from trees and other vegetation on site as brush piles to allow for natural degradation.
  .1 Secure large piles with degradable materials to prevent interference with watercourse.

.6 Remove only trees that may offer future blockage problems as instructed by the Department Representative.

.7 Leave roots mass and stumps in place.

.8 Maintain temporary erosion and pollution control features installed under this

contract.

3.3 Drainage

.1 Pumping water containing suspended materials into watercourse is prohibited.

.2 Establish rock chute spillways to accommodate safe surface water entry to watercourse as directed by the Department Representative.

.3 Install drop pipe inlet system as directed by the Department Representative.

3.4 Restoration

.1 Establish vegetated buffer zones with suitable vegetation to minimum 3 m along edge of watercourse banks as determined by the Department Representative.

.2 Replace topsoil as soon as possible.

.3 Hay mulch or any other possible seed contaminant not to be used on this project for erosion control.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END

APPENDIX A – GEOTECHNICAL REPORT

March 29, 2019

Vincent Roussel, P.Eng., Project Coordinator
Civil Engineer
Crandall Engineering Ltd. - A division of Englobe Corp.
1077 boul. St. George Blvd. Suite 400
Moncton, NB Canada E1E 4C9
(E-mail: vr@crandallengineering.ca)

Subject: 2019 Geotechnical Investigation: Water Distribution and Various Projects
Terra Nova National Park, Glovertown, NL
(Crandall No. 15003-20/23)

Dear Mr. Roussel:

Further to your request and authorization, Englobe Corp. (Englobe) is pleased to submit our report to Crandall Engineering Ltd. - A division of Englobe Corp. for the above-mentioned project located within the Terra Nova National Park at the following areas: (1) administration and housing area, (2) maintenance compound, (3) visitor centre, (4) Newman Sound campground, and (5) Malady Head campground.

The geotechnical investigation was undertaken from March 8 through 25, 2019 and consisted of drilling boreholes for new water and sewer lines and the completion of percolation testing for use in septic field design. The purpose of this investigation was to determine the subsurface soil, rock and groundwater conditions of the site and provide a geotechnical factual data report of the subsurface conditions encountered. Additional engineering design recommendations for a proposed new drinking water tank foundation located near the housing area is also provided herein.

BOREHOLE DRILLING METHODOLOGY

To investigate the subsurface conditions for this project, a total of forty-nine (49) boreholes were advanced using a model CME-75 track-mounted and CME-85 Truck-mounted geotechnical drilling rigs subcontracted by Englobe.

Boreholes were located and marked in the field by the project's surveyor. The approximate borehole locations are shown on the attached drawings in Appendix 2. The survey of the completed borehole locations, to include horizontal and vertical data referenced to a geodetic datum, was completed by and provided by the project's surveyor.

Subsurface conditions recorded by our personnel during the advancement of each borehole included any observed asphalt, fill materials, natural overburden soils, bedrock and inferred groundwater depths. The subsurface conditions are summarized on the Exploration Records and Investigation Summary, Table 1, attached in Appendix 1. An explanation of the method used to sample and describe the subsurface conditions

is presented in the explanatory key; Symbol and Terms Used on the Borehole Records, is also attached in Appendix 1.

Boreholes were advanced using solid stem auger flights of 108 mm diameter (e.g. auger probe) for the vast majority of the boreholes advanced for this project. Two (2) boreholes (i.e., BH-NS-25 and BH-NS-26) were advanced with split spoon SPT sampling to obtain the N-blow count values in additional to a single borehole advanced using diamond wash-bore/rotary drilling methods using HQ-sized (96 mm outside diameter) drilling strings to obtain bedrock core samples.

The auger probe boreholes were advanced to a target drilling depth of 3.0 m depth ground surface or until drilling refusal due to inferred bedrock or boulders. Subsurface soils were not sampled, but they were visually assessed from evacuated drill cuttings and by drilling performance during advancement of the borehole. It should be noted that it is possible to advance augers, depending on the rock mass characteristics, into highly fractured bedrock by a nominal amount, tough it would be difficult to ascertain whether this is the case at the time of drilling with the auger probe drilling method.

Observations on any existing groundwater levels were made at the time of borehole advancement. It should be noted that the boreholes were not left open for a sufficient length of time for groundwater levels to stabilize. Further, groundwater levels at the site may also vary seasonally and in response to precipitation events, site use, and construction activities. Installation of groundwater monitoring wells and periodic monitoring of water levels were not part of the scope of work for this investigation.

Completed boreholes were backfilled using imported gravel materials or cutting materials and the asphalt surface reinstated with patching materials. It is the responsibility of the Client to address any potential hazards due to settlement of backfilled materials should it occur at the borehole locations.

PERCOLATION TESTING METHODOLOGY

A total of eighteen test pits were excavated using a track-mounted mini excavator for percolation testing within the Malady Head and Newman Sound campgrounds. The percolation tests were performed for use in the design of septic fields and the testing was performed in accordance with the Government of Newfoundland and Labrador – Department of Municipal Affairs and Environment's following document to obtain the t-time percolation value: *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems (December 2005).* The completed testing results are provided on the percolation Testing Records, attached in Appendix 1.

SITE GEOLOGY

Based on our review of publicly available surficial geology maps and our review of the bedrock at the project site, the surficial geology is generally composed of thin veneers, generally less than 5 m, of glacio-fluvial till soil comprised of silty sand with gravel to silts with sands, and containing occasional cobbles and boulders.

Bedrock geology underlying the site is comprised of dark greenish grey to dark grey, moderately fractured, hard, slightly metamorphic siliceous sandstones to slates belonging to the Connection Point Group or Musgravetown Group.

SUBSURFACE CONDITIONS

A summary of the subsurface conditions encountered in the boreholes and test pits are provided in the following paragraphs below and on the Borehole and Test Pit Records, attached in Appendix 1. An explanation of symbols and terms used to describe the Borehole and Test Pit Records is also attached in Appendix 1. The soil classification methodology used herein is based on visual-manual field observations following the Unified Soils Classification System (USCS) in general accordance with ASTM D2487 and D2488. Additionally, the soil classification methodology describes oversize particle fractions above 75 mm diameter for cobbles (up to 300 mm in diameter) and boulders (greater than 300 mm in diameter) based on a volumetric percentage that is visually estimated from recovered samples (i.e. from the test pit spoil stockpile, observations during drilling, etc.).

On the Borehole Records, any stratigraphic boundaries typically represent a transition of one soil type to another and do not necessarily indicate an exact plane of geologic change. Further, subsurface conditions may vary between and beyond the testing and sampling locations. A summary of the soil conditions is provided on Table 1 - Investigation Summary, attached in Appendix 1.

Rootmat

Where encountered, a layer of moss and/or organic-rich topsoil and with rootmat encountered at the surface. The layer ranged in thickness from about 30 to 600 mm in thickness. A buried rootmat layer was encountered in borehole BH-NS-20 at about 0.9 m depth.

Asphalt

Approximately 50 to 100 mm of asphalt pavement materials were encountered in boreholes BH-AD-01, BH-MA-04, BH-MC-05, BH-NS-17, BH-NS-18 and BH-NS-19.

Fill

Apparent fill materials were encountered in boreholes in several boreholes, and ranged in depth from about 0.05 to 1.8 m below the existing ground surface.

Fill materials ranged in colour from light brown to brown and described as a well-graded gravel with silty and sand (GW-GM) to silty sand with gravel (SM).

Glacio-Fluvial Till Deposits

Underlying the rootmat or fill layers, a natural glacio-fluvial till deposit was encountered in every borehole. Due to limited observations within the boreholes advanced, it was difficult to distinguish the overlying and fill materials from the natural materials. Inferences made based on the change of particle shape (e.g. more rounded), change in colouration and drilling rate were used to distinguish this layer from the overlying fill layer.

The glacio-fluvial till soils ranged in colour from light brown to dark brown, and ranged in description from well-graded gravel with silt and sand (GW) to silty sand with gravel (SM). The predominant soil deposit at the site is a silty sand with gravel (SM). It should be noted that silt to clayey silt with sand (ML) deposits were encountered in boreholes BH-NS-21, BH-NS-25 and BH-NS-26. The layer also contained varying proportions of over-sized materials, depending on borehole location, from none to some cobbles (0% to 20%) and none to occasional boulders (0% to 10%).

Standard Penetration Tests (SPT) was carried out at regular intervals to obtain the N-Value blow counts using a 50-mm outside diameter split spoon sampler in boreholes BH-NS-25 and BH-NS-26, located at a proposed water storage tank. Based on N-blow count values at this location, the till is described as dense to very dense.

Bedrock

Bedrock is inferred based on auger drilling refusal in boreholes BH-NS-25, BH-AD-01, BH-HA-01, BH-HA-03, BH-MA-01, BH-MA-07, BH-MA-10, BH-MC-03 and BH-MC-04, and at depths ranging from about 2.5 to 2.8 m depth below the existing ground surface. Bedrock was confirmed by diamond drilling with rock core recovery in borehole BH-NS-26 at a depth of about 4.0 to 7.0 m below the existing ground surface.

Bedrock is described based on examination of rock core retrieved in a single borehole (i.e. BH-NS-26) as a dark greenish grey to dark grey, moderately fractured, hard, slightly metamorphic siliceous sandstone to slate. It should be noted that the description colour provided herein and on the Records are based on wet appearance. Based on the rock core specimen in borehole BH-NS-26, the following rock mass characteristics were measured: Rock Quality Designation; RQD = 0-42%, Total Core Recovery; TCR = 70% (30% or approx. 0.7 m rock core not recovered), and Total Rock Cored; TRC = 2.5 m.

GEOTECHNICAL DESIGN RECOMMENDATIONS – PROPOSED NEW WATER TANK

Site Preparation

We understand a new drinking water tank is proposed for this project and is to be located near the exiting housing area at the project site. Conventional shallow foundations, i.e., spread footings, are suitable for the foundations provided that proper site preparation procedures are carried out and all unsuitable materials (e.g. fill, loose soils) are removed to a competent base, and inspected and approved by a qualified professional. Excavations to remove unsuitable soils could extend to about 0.5 m depth. Applicable boreholes used for this assessment are BH-NS-25 and BH-NS-26.

The existing natural glacial till soils; therefore, the soil will be susceptible to softening due to construction traffic, direct exposure to precipitation, groundwater seepage and freezing. It is prudent that the earthworks contractor understand the limitations and is experienced with working in such similar soil conditions encountered at the project site.

Temporary Excavations

All excavation work must conform to the regulations of the Occupational Health and Safety Act of the province of Newfoundland and Labrador at all times and we recommend that a qualified technician or professional review all proposed excavations and slopes. Workers should not enter unstable excavations with vertical sides greater than 1.2 m in height unless appropriate shoring or bracing is provided.

Excavations deeper than 1.2 m in unstable soils could require sloping equivalent to 1.0 Horizontal to 1.0 Vertical. We recommend that excavation sides be carefully monitored and, if necessary, the contractor should slope excavation sides appropriately or use adequate shoring methods. A review of all excavation slopes by a qualified professional is recommended. Additional measures may be required if excavations extend below the water table.

Structural Fill and Compaction

Structural fill materials should consist of a well-graded sand and gravel material such as a Class B roadway gravel or well-graded 100 mm minus rockfill. Maximum particles sizes for the structural fill should generally not exceed 100 mm and the fines content should not exceed 8%.

Structural fill should be placed in lifts no greater than 300 to 400 mm in thickness and compacted when using a walk-behind reversible plate compactor with a weight of at least 1,000 kg. Due to the particle size distribution of coarser grained soils (e.g., rockfill), verification of the field density by visual inspection during proof rolling by geotechnical personnel will be required.

The lateral limits of excavation should be sufficient to accommodate the proposed replacement structural fill with a slope angle of 1.0H:1.0V. These limits are necessary to ensure that the foundation load influence zone are contained within the structural fill.

Structural fill should be placed in even, horizontal lifts, and compacted to the minimum standard Proctor maximum dry density (ASTM D698) depending on construction application as identified below in Table 2:

Table 2: Compaction Requirements

APPLICATION ON STRUCTURAL GRANULAR FILL OR APPROVED BASE	PERCENT OF STANDARD PROCTOR COMPACTION (ASTM D698)
Foundation Bases, Roadway Areas	100
Floor Slab Areas	98
General Backfill	95

Foundation Design

The approach used by Englobe with respect to the bearing pressure recommendations provided herein considers the serviceability limits states (SLS) of the bearing surface, which is referenced in greater detail in the National Building Code of Canada (2015) and the Canadian Foundation Engineering Manual (CFEM), 4th Edition, 2006.

The bearing pressure parameters for shallow foundations on competent bases are assumed to not exceed total settlements of 25 mm and 19 mm for differential settlements and are provided below in Table 3. The values are limited to a minimum foundation dimension of 1,000 mm. In accordance with the CFEM design criteria, a geotechnical resistance value equal to 0.5 for compression was used in determining the factored ULS values.

Table 3: Limit States Design Parameters for Shallow Foundations

LIMIT STATES DESIGN PARAMETER FOR SHALLOW FOUNDATIONS	UNDISTURBED GLACIAL TILL	COMPACTED STRUCTURAL FILL NOTE 1
Serviceability Limit States (SLS) Bearing Pressure	250 kPa	150 kPa
Factored Ultimate Limit States (ULS) Bearing Resistance	450 kPa	450 kPa

Note 1: Assumes a compacted well-graded, pit-run sandy gravel (GW) material or equivalent underlain by a competent base (e.g. undisturbed natural till or bedrock).

To satisfy the SLS/ULS criteria assumed herein, a review and inspection of the exposed subgrades should be completed as required by a qualified and experienced professional, e.g. Professional Engineer, or civil technician with review by a Professional Engineer. The review should qualitatively identify the condition of existing subgrades, its preparation, and subsequent fill placement and compaction, prior to foundation construction and backfilling to final grades.

Foundations should have a minimum soil cover of 1,600 mm for frost protection at this site.

Foundations should not be placed on frozen ground, and temporary frost protection during freezing conditions should be provided after construction of footings in accordance with the Canadian Standards Association's (CSA) Standard A23.1-14.

Based on the subsurface conditions encountered, the site may be considered as Class C (Stiff Soil/Weak Rock) for seismic site response in accordance with the NBCC 2010, Table 4.1.8.4.A.

Slab-On-Grade Construction and Drainage Design

For slab-on-grade construction, a 150 to 200 mm thick layer of compacted, free-draining granular material, such as 19.0 mm minus crushed stone or NL Department of Transportation and Works Class “A” roadway gravel is recommended underneath the floor slab.

Site preparation, subgrade preparation, fill placement, and compaction methods described herein must also be followed for any slab-on-grade construction. Slabs constructed on properly prepared bases may be designed using a subgrade modulus of reaction of 50 kPa/mm.

The requirements for long-term or permanent drainage control around and below the structures will depend on the details of the site development and the final finished grades. A perforated drain pipe, surrounded with clear stone and leading to a positive discharge is recommended along exterior strip foundations. At this site, it is anticipated that groundwater would be below the depth of the foundations, therefore a weeping tile drainage system may not be required unless otherwise required by the City of St. John’s Planning Department.

Construction Quality Control

The following comments on specific construction aspects of the project are provided for the guidance of designers. The contractor undertaking the work should make their own interpretation of the factual information provided in this report as it affects their construction procedures and scheduling.

We recommend that a licensed professional supervise an inspection and testing program during any earthworks, verification of any bases, structural fill selection, backfill placement, and foundation construction. The program should include verification and approval of excavation bases before placement of structural fill (e.g. founding level inspection); verification of the type of structural fill and material to be used; compaction testing during structural fill placement; and, testing of construction materials (e.g. aggregate, asphalt and concrete).

CLOSURE

This report has been prepared for the sole benefit of the Crandall Engineering Ltd. - A division of Englobe Corp., and their agents, and may not be used by any third party without the express written consent of Englobe Corp. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

A subsurface investigation is a limited sampling of a site and the geotechnical investigation undertaken has involved random sampling of site conditions. Borehole information is provided for guidance and is only accurate for the exact location where drilled; therefore, inference on subsurface conditions between borehole locations is left for the user(s) of this information to determine. The comments and recommendations given herein are based on information gathered at specific sampling locations and can only be extrapolated to an undefined limited area around these locations. Variations throughout the site may differ from data collected at the sample locations. The extent of the limited area depends on the subsurface conditions encountered (e.g. soil, rock and groundwater), as well as the history of the site reflecting natural, construction and other activities.

We trust this report meets your present requirements. Should any additional information be required, please do not hesitate to contact our office at your convenience.

Respectively submitted,

Englobe Corp.

Erich Lenz, PE, P.Eng.
Project Manager, Civil / Geotechnical Engineer
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REGISTERED PROFESSIONAL ENGINEER
pegnl
PROFESSIONAL ENGINEERS & GEOSCIENTISTS
NEWFOUNDLAND & LABRADOR
ERICH W. T. LENZ
SIGNATURE
Mar. 29, 2019
DATE
NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND AND LABRADOR
pegnl
ENGINEERING
PERMIT T0282
This Permit Allows
ENGLOBE CORP.
Member in Responsible Charge:
ERICH W.T. LENZ, P.Eng. No. 05754
To practice Professional Engineering in Newfoundland and Labrador which is valid for year 2019.

Attachments:

Appendix 1 Table 1: Investigation Summary
Symbols and Terms Used on the Borehole Records
Borehole and Percolation Testing Records

Appendix 2 Site Plans (Borehole Locations)

Appendix 1

Table 1: Investigation Summary

Symbol and Terms Used on the Borehole Records

Exploration Records

Englobe

Point ID	Coordinates (m) Elev.	East	North	Total Depth (m)	Water Depth (m)	Rootmat/ Peat etc. (mm)	Fill Depth (m)	Bedrock Depth (m)	Notes
BH-AD-01				2.84	-	-	1.52	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-EC-01				3.05	-	-	1.22	See Notes	End of Test Pit/Borehole at Target Depth
BH-HA-01	60.8	280149	5381333	2.44	-	300	-	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-HA-02	64.6	280268	5381387	3.05	-	-	1.83	See Notes	End of Test Pit/Borehole at Target Depth
BH-HA-03	67.5	280155	5381379	2.59	-	75	1.22	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MA-01	63.7	285024	5392365	2.54	-	-	0.61	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MA-02	52.8	285137	5392416	3.05	-	-	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-03	43.9	285200	5392467	3.05	-	-	0.18	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-04	40.4	285266	5392456	3.05	-	-	0.18	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-05	34.0	285346	5392457	3.05	3.05	-	0.10	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-06	30.6	285381	5392532	3.05	2.59	-	0.15	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-07	23.4	285490	5392558	2.74	2.59	-	0.23	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MA-08	10.6	285712	5392705	3.05	2.44	-	0.46	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-09	16.9	285593	5392579	3.05	-	50	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-MA-10	16.2	285662	5392637	1.52	-	-	0.10	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MC-01	73.4	280435	5381967	3.05	-	300	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-MC-02	70.9	280487	5382101	3.05	-	300	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-MC-03	71.0	280556	5382268	2.74	-	300	-	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MC-04	86.0	280602	5382402	2.74	-	300	-	See Notes	Borehole terminated due to drilling refusal on boulders or inferred bedrock.
BH-MC-05	100.4	280489	5382478	3.05	-	-	0.46	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-01	11.7	280039	5380346	3.05	-	-	0.10	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-02	12.5	279996	5380441	3.05	-	100	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-03	13.9	280159	5380484	3.05	-	100	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-04	15.6	280312	5380470	3.05	-	-	0.10	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-05	17.7	280371	5380674	3.05	-	100	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-06	18.9	280493	5380649	3.05	-	-	0.46	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-07	23.5	280532	5380831	3.05	-	-	0.10	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-08	26.2	280417	5380823	3.05	-	25	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-09	26.0	280316	5380943	3.05	-	-	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-10	25.6	280278	5380798	3.05	-	-	0.05	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-11	29.0	280165	5380660	3.05	-	-	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-12	28.6	280043	5380582	3.05	-	-	0.10	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-13	28.8	280064	5380833	3.05	-	-	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-14	18.3	280749	5380562	3.05	-	-	1.22	See Notes	End of Test Pit/Borehole at Target Depth

INVESTIGATION SUMMARY*

**NOTE: Refer to report for full context on table limitations.*

Point ID	Coordinates (m) Elev.	East	North	Total Depth (m)	Water Depth (m)	Rootmat/ Peat etc. (mm)	Fill Depth (m)	Bedrock Depth (m)	Notes
BH-NS-15	22.4	280721	5380703	3.05	-	25	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-16	23.9	280879	5380726	3.05	-	-	1.22	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-17	25.4	280775	5380894	3.05	-	-	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-18	25.5	280700	5380909	3.05	-	-	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-19	25.5	280749	5381035	3.05	-	-	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-20	26.1	280600	5381065	3.05	-	910	0.61	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-21	17.0	280711	5381148	3.05	-	605	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-22	9.8	280839	5381189	3.05	-	455	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-23	28.2	280011	5381007	3.05	-	100	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-24	44.8	280052	5381198	3.05	-	-	0.46	See Notes	End of Test Pit/Borehole at Target Depth
BH-NS-25	59.4	280060	5381310	4.72	-	-	0.61	See Notes	Borehole terminated due to refusal on inferred bedrock.
BH-NS-26	59.9	280059	5381323	7.04	-	-	0.61	5.51	End of Test Pit/Borehole at Target Depth
BH-VC-01	4.0	282565	5384882	3.05	-	-	1.83	See Notes	End of Test Pit/Borehole at Target Depth
BH-VC-02	4.0	282410	5384929	3.05	-	-	-	See Notes	End of Test Pit/Borehole at Target Depth
BH-VC-03	10.1	282252	5385035	3.05	-	-	0.15	See Notes	End of Test Pit/Borehole at Target Depth
PC-HA-12A				1.07	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-HA-12B				1.22	-	300	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-HA-12C				1.07	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-MA-13A				1.07	-	300	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-MA-13B				0.25	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-MA-13C				0.30	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-MA-13D				0.30	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-1	27.7	279993	5380758	1.22	-	25	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-2	11.6	280125	5380383	0.91	-	200	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-3	15.4	280402	5380536	1.07	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-4	15.2	280498	5380523	1.22	-	150	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-5	20.3	280504	5380692	1.22	-	265	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-6	27.8	280216	5380815	1.22	-	200	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-8	25.9	280298	5380842	1.07	-	150	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-9A	26.7	280351	5380864	1.22	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-9B				1.22	-	300	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-9C				1.07	-	250	-	See Notes	End of Test Pit/Borehole at Target Depth
PC-NS-10	16.9	280275	5380609	1.22	-	150	-	See Notes	End of Test Pit/Borehole at Target Depth

INVESTIGATION SUMMARY*

**NOTE: Refer to report for full context on table limitations.*

Soil Description

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils. Terminology describing soil structure:

Desiccated:	Having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured:	Having cracks, and hence a blocky structure.
Varved:	Composed of regular alternating layers of silt and clay.
Stratified:	Composed of alternating layers or different soil types, e.g. silt and sand or silt and clay.
Well-Graded:	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes.
Poorly Graded:	Predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy), or frequent	20-35%
And (e.g. silt and sand), or frequent	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test (SPT) to obtain the 'N'-value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (e.g. 305 mm) into the soil. This is the Standard Penetration Test referred to in ASTM D1586.

Relative Density	'N'-Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by in situ vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests (SPT).

Consistency	Undrained Shear Strength (Kips/sq.ft.)	(kPa)	'N'-Value
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

Soil Samples

TYPE - The type of sample is indicated in this column as follows:

A - auger sample	D - drive sample	SS - split spoon (SPT)
B - block sample	G - grab sample	U - thin-walled, tube sample
C - rock core, or frozen soil core	O - other (see report text)	W - wash or air return sample
	P - Pitcher tube sample	

Condition of the sample is indicated as follows:

Undisturbed Disturbed Not Recovered

Note: Dashed/dotted lines seperating subsurface descriptions on the records indicates inferred stratigraphy boundaries.

Unified Soil Classification System (USCS)

(ASTM D2478/2488)

Unified Soil Classification and Symbol Chart

Coarse-Grained Soils

(more than 50% of material is larger than No. 200 sieve size)

GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	**Clean Gravels (less than 5% fines)**		
		GW	Well-graded GRAVEL or, Well-graded GRAVEL with sand
		GP	Poorly graded GRAVEL or, Poorly graded GRAVEL with sand
	Gravels with fines (more than 12% fines)		
		GM	Silty GRAVEL or, Silty GRAVEL with sand
		GC	Clayey GRAVEL or, Clayey GRAVEL with sand
SANDS More than 50% of coarse fraction larger than No. 4 sieve size	**Clean Sands (less than 5% fines)**		
		SW	Well-graded SAND or, Well-graded SAND with gravel
		SP	Poorly graded SAND or, Poorly graded SAND with gravel
	Sands with fines (more than 12% fines)		
		SM	Silty SAND or, Silty SAND with gravel
		SC	Clayey SAND or, Clayey SAND with gravel

Fine-Grained Soils

(50% or more of material is smaller than No. 200 sieve size)

SILTS and CLAYS Liquid Limit (LL) less than 50%	**ML**	SILT, SILT with sand or gravel, sandy or gravelly SILT, sandy or gravelly SILT with sand or gravel
	CL	LEAN CLAY, LEAN CLAY with sand or gravel, sandy or gravelly LEAN CLAY with/with out sand or gravel
	OL	ORGANIC SOIL, ORGANIC SOIL with sand or gravel, sandy or gravelly ORGANIC SOIL with sand or gravel
SILTS and CLAYS Liquid Limit (LL) greater than 50%	**MH**	ELASTIC SILT, ELASTIC SILT with sand or gravel, sandy or gravelly ELASTIC SILT, sandy or gravelly ELASTIC SILT
	CH	FAT CLAY, FAT CLAY with sand or gravel, sandy or gravelly FAT CLAY with sand or gravel
	OH	ORGANIC SOIL, ORGANIC SOIL with sand or gravel, sandy or gravelly ORGANIC SOIL with sand or gravel
HIGHLY ORGANIC SOILS	**PT**	Peat and other highly organic soils

Other typical material symbols use on the records:

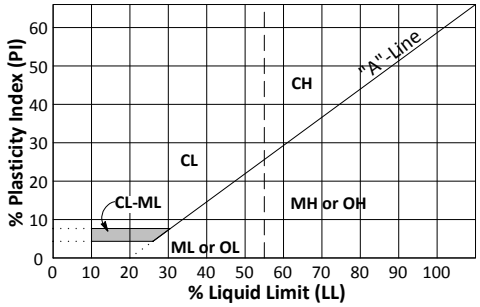
Fill Till Bedrock Sod/Topsoil

Laboratory Classification Criteria

C_u - Hazen coefficient of uniformity
C_c - Coefficient of curvature or gradation
D_{10}, D_{30}, D_{60} - Effective grain size as % finer passing on gradation curve

GW	$C_u = \frac{D_{60}}{D_{10}}$ and > 4.0; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ >1.0 and <= 3.0	
GP	Not meeting all gradation criteria above for GW	
GM	Atterberg limits below "A"-line or P.I. less than 4.0	Above "A" line with P.I. between 4 and 7 are borderline requiring dual symbols
GC	Atterberg limits above "A"-line with P.I. greater than 7.0	
SW	$C_u = \frac{D_{60}}{D_{10}}$ and > 4.0; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ >1.0 and <= 3.0	
SP	Not meeting all gradation criteria above for SW	
SM	Atterberg limits below "A"-line or P.I. less than 4.0	Above "A" line with P.I. between 4 and 7 are borderline requiring dual symbols
SC	Atterberg limits above "A"-line with P.I. greater than 7.0	

Plasticity Chart



Classification of Particle Sizes

Clay:	<0.002 mm
Silt:	0.002 to 0.075 mm
Sand:	0.075 to 4.75 mm
Gravel:	<3 inches (<75 mm)
Cobbles*:	3 to 12 inches (75 to 305 mm)
Boulders*:	>12 inches (>305 mm)

**NOTE: Boulders and cobbles are not considered soil or part of the soil classification or description, except under miscellaneous descriptions; i.e. with occasional cobbles at about 5 percent (volume), etc.*

Englobe

2019 Geotech Investigation - Water Distribution Recapitalization
Terra Nova National Park, Glovertown, NL

Project No.: 15003-20/23

Symbols and Terms Used on the Test Records

AUGER PROBE BH-AD-01

LOCATION: Administration Building
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
				ASPHALT.		
				Brown, gravelly SAND with occasional cobbles (GM). [FILL]		
2						
	1					
4						
				Brown, silty SAND gravel (SM); occasional cobbles. [Glacio-Fluvial TILL]		
6						
	2					
8						
10	3			**End of AUGER PROBE at 2.84 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-EC-01

LOCATION: Eco Centre
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
				Brown, well-graded SAND with silt and gravel (SW-SM); some cobbles, trace organic matter. [FILL]		
2						
	1					
4				Brown to light brown, silty SAND with trace gravel (SM), occasional cobbles and boulders. [Glacio-Fluvial TILL]		
6						
	2					
8						
10	3			**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-HA-01

LOCATION: Housing Area N 5381332 E 280149
COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		60.8		Dark brown, TOPSOIL and ROOTMAT.		
		60.5		Grey, silty SAND (SM); trace gravel and occasional cobbles. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8		58.3				
10	3			**End of AUGER PROBE at 2.44 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-HA-02

LOCATION: Housing Area N 5381386 E 280268
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME - 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		64.6		Brown, well-graded SAND with gravel (SW); trace silt and cobbles. [FILL]		
2						
	1					
4						
		62.8				
6				Light brown, silty SAND (SM). [Glacio-Fluvial TILL]		
	2					
8						
10	3	61.6		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-HA-03

LOCATION: Housing Area N 5381379 E 280155
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		67.5				
		67.4		Organics ROOTMAT.		
				Brown, well-graded SAND with gravel (SW); with occasional to some cobbles. [FILL]		
2						
	1					
4		66.3				
				Brown, silty SAND with gravel (SM); occasional to some cobbles, occasional boulders. [Glacio-Fluvial TILL]		
6						
	2					
8		64.9				
10	3			**End of AUGER PROBE at 2.59 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MA-01

LOCATION: Malady Head Campground N 5392364 E 285023
COMPLETED ON: 15/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		63.7		Grey, well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate, trace organics. [FILL]		
		63.1				
2				Dark brown to light brown, silty SAND with gravel (SM); occasional cobbles and boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8		61.1				
10	3			**End of AUGER PROBE at 2.54 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MA-02

LOCATION: Malady Head Campground N 5392416 E 285137
COMPLETED ON: 14/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		52.8		Dark brown to brown to orange brown, silty SAND gravel (SM); occasional cobbles; trace to some organics at surface. [FILL]		
		50.6		Light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
		49.7		**End of AUGER PROBE at 3.05 m depth**		

AUGER PROBE BH-MA-03

LOCATION: Malady Head Campground N 5392466 E 285199
COMPLETED ON: 14/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		43.9				
		43.7		Grey, well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate, trace organics. [FILL]		
				Grey brown to dark brown, silty SAND with gravel (SM); occasional cobbles. [Glacio-Fluvial TILL]		
		40.8		**End of AUGER PROBE at 3.05 m depth**		

AUGER PROBE BH-MA-04

LOCATION: Malady Head Campground N 5392455 E 285265
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		40.4				
		40.4		50 mm ASPHALT.		
		40.2		Grey, well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate, trace organics. [FILL]		
				Brown, silty SAND with gravel (SM); trace to some cobbles and boulders. [Glacio-Fluvial TILL]		
		37.4		**End of AUGER PROBE at 3.05 m depth**		

AUGER PROBE BH-MA-05

LOCATION: Malady Head Campground N 5392457 E 285345
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		34.0				
		33.9		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2				Brown to reddish brown, silty SAND with trace to some gravel (SM); trace to some cobbles and organics. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	31.0				
				End of AUGER PROBE at 3.05 m depth *Inferred groundwater at 3.0 m depth.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MA-06

LOCATION: Malady Head Campground N 5392532 E 285381
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		30.6				
		30.4		Grey; well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate. [FILL]		
2				Light brown to brown to reddish brown; silty SAND with gravel (SM); trace to some cobbles. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	27.5				
				End of AUGER PROBE at 3.05 m depth *Inferred groundwater at 2.6 m depth.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MA-07

LOCATION: Malady Head Campground N 5392557 E 285490
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		23.4				
		23.2		Grey; well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate, trace organics. [FILL]		
2				Dark brown to black; silty SAND trace gravel (SM); occasional to some cobbles, occasional boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8		20.7				
10	3			**End of AUGER PROBE at 2.74 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.* *Inferred groundwater at 2.6 m depth.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MA-08

LOCATION: Malady Head Campground N 5392704 E 285712
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		10.6		Grey; well-graded GRAVEL with sand some cobbles/boulders (GW); roadway aggregate. [FILL]		
		10.1		Grey brown; silty SAND (SM); trace to some gravel, occasional cobbles. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8 ▽						
10	3	7.5				
12				**End of AUGER PROBE at 3.05 m depth** *Inferred groundwater at 2.4 m depth.*		
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-MA-09

LOCATION: Malady Head Campground N 5392578 E 285592
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		16.9				
		16.9		Moss and organic ROOTMAT.		
				Dark brown to light brown, silty SAND with gravel (SM); occasional to some cobbles and boulders; trace to some organics. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	13.9				
12				**End of AUGER PROBE at 3.05 m depth**		
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-MA-10

LOCATION: Malady Head Campground N 5392636 E 285661
COMPLETED ON: 13/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		16.2				
		16.1		Grey, well-graded GRAVEL with sand (GW); roadway aggregate, trace organics. [FILL]		
				Dark grey to brown, silty SAND (SM); trace gravel, trace to some cobbles. [Glacio-Fluvial TILL]		
2						
	1					
4		14.7				
6				**End of AUGER PROBE at 1.52 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
	2					
8						
10	3					
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-MC-01

LOCATION: Maintenance Compound N 5381967 E 280434

COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** S.B.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		73.4				
		73.1		Dark brown, TOPSOIL and ROOTMAT.		
2				Grey, silty SAND with gravel (SM); occasional cobbles and boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	70.4				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MC-02

LOCATION: Maintenance Compound N 5382101 E 280487

COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** S.B.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		70.9				
		70.6		Dark brown, TOPSOIL and ROOTMAT.		
2				Grey, silty SAND with some pebbles (SM), trace boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	67.8				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MC-03

LOCATION: Maintenance Compound N 5382267 E 280555

COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** L.C.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		71.0				
		70.7		Dark brown, TOPSOIL and ROOTMAT.		
2				Grey, silty SAND with gravel (SM); occasional boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
		68.3				
10	3			**End of AUGER PROBE at 2.74 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MC-04

LOCATION: Maintenance Compound N 5382402 E 280602

COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** L.C.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		86.0				
		85.7		Dark brown, TOPSOIL and ROOTMAT.		
2				Grey, silty SAND with gravel (SM); occasional cobbles and boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
		83.2				
10	3			**End of AUGER PROBE at 2.74 m depth** *Borehole terminated due to drilling refusal on boulders or inferred bedrock.*		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-MC-05

LOCATION: Maintenance Compound N 5382478 E 280488

COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** L.C.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		100.4				
		100.3		ASPHALT.		
		100.0		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2				Dark brown to light brown, silty SAND with gravel (SM); occasional cobbles. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	97.4		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-01

LOCATION: Newman Sound Campground N 5380346 E 280038

COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		11.7				
		11.6		Grey, well-graded GRAVEL with silt and sand (GW-GM); roadway aggregate. [FILL]		
2				Reddish brown to light brown, silty SAND with trace to some gravel. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	8.7		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-02

LOCATION: Newman Sound Campground N 5380441 E 279996
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		12.5				
		12.4		Dark brown; organic ROOTMAT.		
				Reddish brown to brown, silty SAND with trace to some gravel; trace cobbles. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	9.5				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-03

LOCATION: Newman Sound Campground N 5380483 E 280158
COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		13.9				
		13.8		Dark brown; organic ROOTMAT.		
				Reddish brown to light brown, silty SAND with trace to some gravel. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	10.9				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-04

LOCATION: Newman Sound Campground N 5380470 E 280311
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		15.6				
		15.5		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
				Reddish brown to light brown, silty SAND with trace to some gravel. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	12.5				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-05

LOCATION: Newman Sound Campground N 5380674 E 280370
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		17.7				
		17.6		Dark brown; organic ROOTMAT.		
				Reddish brown to light brown, silty SAND with gravel (SM) to silty SAND (SM). [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	14.6				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-06

LOCATION: Newman Sound Campground N 5380648 E 280492
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		18.9				
				Light brown to reddish brown, well-graded SAND with silt and gravel (SW-SM); trace cobbles. [FILL]		
		18.4				
2				Light brown to brown, silty SAND with gravel (SM); trace cobbles. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	15.8				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-07

LOCATION: Newman Sound Campground N 5380831 E 280532
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		23.5				
		23.4		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2				Light brown to reddish brown to brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	20.5				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-08

LOCATION: Newman Sound Campground N 5380822 E 280416
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		26.2				
		26.2		Moss and organic ROOTMAT.		
				Reddish brown to light brown, silty SAND with gravel (SM); occasional cobbles. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	23.1				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-09

LOCATION: Newman Sound Campground N 5380943 E 280315
COMPLETED ON: 08/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		26.0				
		26.0		Moss and organic ROOTMAT.		
				Dark brown to reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	22.9				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-10

LOCATION: Newman Sound Campground N 5380798 E 280277
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		25.6				
		25.5		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
				Dark brown to reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	22.5				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-11

LOCATION: Newman Sound Campground N 5380659 E 280165
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		29.0		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2		28.4		Reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	26.0		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-12

LOCATION: Newman Sound Campground N 5380581 E 280043
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		28.6				
		28.5		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2				Dark brown to reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	25.6		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-13

LOCATION: Newman Sound Campground N 5380832 E 280063
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		28.8		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2		28.2		Brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	25.7		**End of AUGER PROBE at 3.05 m depth**		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-14

LOCATION: Newman Sound Campground N 5380561 E 280748
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		18.3		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2	1	17.1		Brown to light brown to reddish brown, silty SAND with gravel (SM); occasional cobbles and boulders. [Glacio-Fluvial TILL]		
4						
6	2					
8						
10	3	15.2		**End of AUGER PROBE at 3.05 m depth**		
12	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-15

LOCATION: Newman Sound Campground N 5380702 E 280721
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		22.4		Moss and organic ROOTMAT.		
2	1	22.4		Reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
4						
6	2					
8						
10	3	19.4		**End of AUGER PROBE at 3.05 m depth**		
12	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-16

LOCATION: Newman Sound Campground N 5380725 E 280879
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		23.9		Brown, well-graded SAND with gravel and trace to some silt (SW) to silty SAND with trace to some gravel (SM). [FILL]		
2	1	22.7		Reddish brown to light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
4						
6	2					
8						
10	3	20.9		**End of AUGER PROBE at 3.05 m depth**		
12	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-17

LOCATION: Newman Sound Campground N 5380893 E 280774
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		25.4				
		25.3		ASPHALT.		
				Dark Brown to light brown, silty SAND with some gravel (SM); occasional cobbles. [FILL]		
2		24.8		Brown, silty SAND with gravel (SM); occasional to some boulders and occasional cobbles. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	22.4		End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-18

LOCATION: Newman Sound Campground N 5380909 E 280700
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		25.5				
		25.4		ASPHALT.		
				Dark brown to light brown, silty SAND with gravel (SM); occasional cobbles. [FILL]		
2		24.9		Brown, silty SAND with gravel (SM); occasional to some boulders and occasional cobbles. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	22.4		End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-19

LOCATION: Newman Sound Campground N 5381035 E 280748
COMPLETED ON: 18/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		25.5				
		25.4		ASPHALT.		
				Brown to dark brown, silty SAND with gravel (SM). [FILL]		
2		24.9		Brown, silty SAND with gravel (SM); occasional to some cobbles and occasional boulders. [Glacio-Fluvial TILL]		
	1					
4						
6						
	2					
8						
10	3	22.5		End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-20

LOCATION: Newman Sound Campground N 5381064 E 280599

COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** S.B.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		26.1				
		26.1		Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2		25.5		Brown, well-graded gravelly SAND (SW). [FILL]		
	1	25.2		Brown, ORGANICS with trace sand and some silt. [buried organic ROOTMAT]		
4				Reddish brown to brown, silty SAND with gravel (SM) to well-graded SAND with gravel and silt (SW-SM); occasional cobbles. [Glacio-Fluvial TILL]		
6	2					
8						
10	3	23.1				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-21

LOCATION: Newman Sound Campground N 5381147 E 280711

COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** S.B.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		17.0				
				Organic ROOTMAT.		
2		16.4		Brown, SILT with trace sand and gravel (ML). [Glacio-Fluvial TILL]		
	1					
4		15.8		Brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
6	2					
8						
10	3	13.9				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-22

LOCATION: Newman Sound Campground N 5381188 E 280839

COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** S.B.

EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		9.8				
				Organic ROOTMAT.		
		9.3				
2				Brown, well-graded SAND with silt and gravel (SW-SM). [Glacio-Fluvial TILL]		
	1					
4						
6	2					
8						
10	3	6.7				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-NS-23

LOCATION: Newman Sound Campground N 5381006 E 280011
COMPLETED ON: 20/03/2019 **DWN:** E.L. **CHK'D:** S.B.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		28.2				
		28.1		Organic ROOTMAT.		
				Brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	25.2				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

AUGER PROBE BH-NS-24

LOCATION: Newman Sound Campground N 5381197 E 280052
COMPLETED ON: 19/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		44.8				
				Grey, well-graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
		44.3				
				Brown, silty SAND with gravel (SM); occasional to some cobbles, occasional boulders. [Glacio-Fluvial TILL]		
2						
	1					
4						
6						
	2					
8						
10	3	41.7				
				End of AUGER PROBE at 3.05 m depth		
12						
	4					
14						
16						
	5					
18						
	6					

BOREHOLE RECORD BH-NS-25

LOCATION: Newman Sound Campground N 5381310 E 280060
COMPLETED ON: 21/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85 / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		59.4				
				Very loose, light brown to reddish brown, sandy SILT (ML) to silty SAND (SM); with trace to some gravel, trace organics. [FILL]	SS #SS1	N=2
		58.8				
2				Dense, light brown, well-graded GRAVEL with sand (GW) to well-graded SAND with silt and gravel (SW-SM). [Glacio-Fluvial TILL]		
	1				SS #SS2	N=37
4						
6					SS #SS3	N=107
	2					
8					SS #SS4	N=50/25mm
10	3	56.4				
				Very dense, reddish brown, sandy SILT (ML) to silty SAND with gravel (SM). [Glacio-Fluvial TILL]	SS #SS5	N=75
					SS #SS6	N=62/130mm
12		55.8				
				Very dense, brown, sandy SILT with trace to some gravel (ML). [Glacio-Fluvial TILL]		
4						
14					SS #SS7	N=74
		54.7			SS #SS8	N=90/150mm
16				**End of Borehole at 4.72 m depth** *Borehole terminated due to refusal on inferred bedrock.*		
	5					
18						
	6					

BOREHOLE RECORD BH-NS-26

LOCATION: Newman Sound Campground N 5381323 E 280059
COMPLETED ON: 20/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85 / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		59.9		Dense, light brown to reddish brown, sandy SILT (ML) to silty SAND (SM); with trace to some gravel, trace organics. [FILL]	SS #SS1	N=30
2		59.3		Very dense, light brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]	SS #SS2	N=50/75mm
4	1					
6					SS #SS3	N=53
8	2				SS #SS4	N=50/75mm
10	3	56.9		Very dense, reddish brown, sandy SILT (ML) to silty SAND with some gravel (SM); trace shale rock fragments. [Glacio-Fluvial TILL]	SS #SS5	N=50/100mm
12	4	56.3		Very dense, grey, sandy SILT with gravel (ML). [Glacio-Fluvial TILL]	SS #SS6	N=60/50mm
14		55.4		Very severely fractured bedrock (see descrp. below). [FRACTURED BEDROCK]	CORE #RC1	RQD: 0%
16	5				CORE #RC2	RQD: 0%
18		54.4		Dark greenish grey to dark grey, very to moderately fractured, week to medium strong, slightly metamorphic siliceous sandstone	CORE #RC3	RQD: 46%
	6					

BOREHOLE RECORD BH-NS-26

LOCATION: Newman Sound Campground N 5381323 E 280059
COMPLETED ON: 20/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85 / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		59.9		to slate. [BEDROCK]	CORE #RC4	RQD: 0%
22	7	52.9		**End of Borehole at 7.04 m depth**		
24						
26	8					
28						
30	9					
32						
	10					
34						
36	11					
38						
	12					

AUGER PROBE BH-VC-01

LOCATION: Visitor Centre N 5384882 E 282565
COMPLETED ON: 14/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		4.0		Dark brown, silty SAND with gravel (SM); occasional cobbles, trace clay and organics. [FILL]		
2						
4	1					
6		2.1		Orange brown; poorly-graded SAND (SP); trace silt and gravel. [Glacio-Fluvial TILL]		
8	2					
10	3	0.9		**End of AUGER PROBE at 3.05 m depth**		
12						
14	4					
16						
18	5					
	6					

AUGER PROBE BH-VC-02

LOCATION: Visitor Centre N 5384929 E 282410
COMPLETED ON: 14/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		4.0		Dark brown to light brown, silty SAND with gravel (SM); occasional cobbles. [Glacio-Fluvial TILL]		
2	1					
4						
6	2					
8						
10	3	0.9				
				End of AUGER PROBE at 3.05 m depth		
12	4					
14						
16	5					
18						
	6					

AUGER PROBE BH-VC-03

LOCATION: Visitor Centre N 5385035 E 282251
COMPLETED ON: 14/03/2019 **DWN:** E.L. **CHK'D:** L.C.
EQUIP./METHOD: CME- 45/85

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		10.1				
		10.0		Grey, well graded GRAVEL with sand (GW); roadway aggregate. [FILL]		
2	1			Grey to brown, well-graded SAND with trace silt (SW) to silty SAND with trace gravel (SM). [Glacio-Fluvial TILL]		
4						
6	2					
8						
10	3	7.1				
				End of AUGER PROBE at 3.05 m depth		
12	4					
14						
16	5					
18						
	6					

Percolation Test PC-HA-12A

LOCATION: Housing Area
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
				Dark brown, TOPSOIL and ROOTMAT.		
2	1			Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
4				**End of Percolation Test at 1.07 m depth** *Water seepage @ 1m. Water level dropped approximately 25mm in one minute and another 25mm after second minute.*		
6	2					
8						
10	3					
12	4					
14						
16	5					
18						
	6					

Percolation Test PC-HA-12B

LOCATION: Housing Area
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0				**End of Percolation Test at 1.22 m depth** *Water seepage @ 1m. Water level held at approximately 300mm. Water level dropped approximately 250mm in five minutes.*		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-HA-12C

LOCATION: Housing Area
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5				**End of Percolation Test at 1.07 m depth** *Water seepage @ 1m. Water level did not drop approximately in one minute, droppedapproximately 51mm after three minutes and approximately 102mm after five minutes.*		
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-MA-13A

LOCATION: Malady Head Campground
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5				**End of Percolation Test at 1.07 m depth** *Water seepage @ 1m. Water level dropped approximately 102mm after two minutes.*		
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-MA-13B

LOCATION: Malady Head Campground
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0				BEDROCK.		
1.5	0.5			**End of Percolation Test at 0.25 m depth**		
2.0				*Bedrock encountered directly under rootmat.*		
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-MA-13C

LOCATION: Malady Head Campground
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0						
1.5	0.5			**End of Percolation Test at 0.30 m depth**		
2.0				*Bedrock encountered directly under rootmat.*		
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-MA-13D

LOCATION: Malady Head Campground
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0						
1.5	0.5			**End of Percolation Test at 0.30 m depth**		
2.0				*Bedrock encountered directly under rootmat.*		
2.5						
3.0	1.0					
3.5						
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-1

LOCATION: Newman Sound Campground N 5380758 E 279992
COMPLETED ON: 22/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		27.7				
		27.7		Dark brown, organic PEAT (PT).		
0.5				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0		26.5				
4.5				**End of Percolation Test at 1.22 m depth** *Free draining material. t value of 5 assigned.*		
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-2

LOCATION: Newman Sound Campground N 5380382 E 280125
COMPLETED ON: 20/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		11.6				
0.5				Dark brown, TOPSOIL and ROOTMAT.		
		11.4				
1.0				Brown, silty SAND with gravel (SM). [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5				**End of Percolation Test at 0.91 m depth** *Snow covered. Frost to aproximately 300mm. Free draining clean material. t value of 5 assigned.*		
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-3

LOCATION: Newman Sound Campground N 5380536 E 280401
COMPLETED ON: 20/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		15.4				
0.5				Dark brown, TOPSOIL and ROOTMAT.		
		15.2				
1.0				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5		14.4				
4.0				**End of Percolation Test at 1.07 m depth** *Frost extended approximately 500mm. Free draining clean material. t value of 5 assigned.*		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-4

LOCATION: Newman Sound Campground N 5380523 E 280498
COMPLETED ON: 21/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		15.2				
		15.1		Dark brown, TOPSOIL and ROOTMAT.		
0.5				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0		14.0				
4.5				**End of Percolation Test at 1.22 m depth** *Free draining material. Water level dry in one minute. t value of 5 assigned.*		
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-5

LOCATION: Newman Sound Campground N 5380692 E 280503
COMPLETED ON: 21/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		20.3				
				Dark brown, TOPSOIL and ROOTMAT.		
0.5		20.1		Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0		19.1				
4.5				**End of Percolation Test at 1.22 m depth** *Free draining material. Water level dropped approximately 178mm in one minute. t value of 5 assigned.*		
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-6

LOCATION: Newman Sound Campground N 5380814 E 280215
COMPLETED ON: 20/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		27.8				
				Dark brown, TOPSOIL and ROOTMAT.		
0.5		27.6		Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0		26.6				
4.5				**End of Percolation Test at 1.22 m depth** *Free draining material. Water level dropped approximately 76mm in one minute. t value of 5 assigned.*		
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-8

LOCATION: Newman Sound Campground N 5380841 E 280297
COMPLETED ON: 20/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		25.9		Dark brown, TOPSOIL and ROOTMAT.		
0.5		25.7		Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0	24.8				
3.5				**End of Percolation Test at 1.07 m depth** *Frost extended approximately 800mm. Free draining clean sand. t value of 5 assigned.*		
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-9A

LOCATION: Newman Sound Campground N 5380863 E 280350
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		26.7		Dark brown, TOPSOIL and ROOTMAT.		
0.5		26.4		Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.0						
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0		25.5		**End of Percolation Test at 1.22 m depth** *Mostly free draining material. Water level dropped approximately 51mm in 2 minutes. t value of 5 assigned.*		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-9B

LOCATION: Newman Sound Campground
COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**
EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
				Dark brown, TOPSOIL and ROOTMAT.		
0.5						
1.0				Brown, silty SAND with gravel (SM); some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0	1.0					
3.5						
4.0				**End of Percolation Test at 1.22 m depth** *Free draining material. Water level dropped approximately 127mm in one minute. t value of 5 assigned.*		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-9C

LOCATION: Newman Sound Campground

COMPLETED ON: 25/03/2019 **DWN:** S.B. **CHK'D:**

EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
0.5				Dark brown, TOPSOIL and ROOTMAT.		
1.0				Brown, silty SAND with gravel (SM); and cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0						
	1.0					
3.5				**End of Percolation Test at 1.07 m depth** *Free draining material. Water level dropped approximately 152mm in one minute. t value of 5 assigned.*		
4.0						
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Percolation Test PC-NS-10

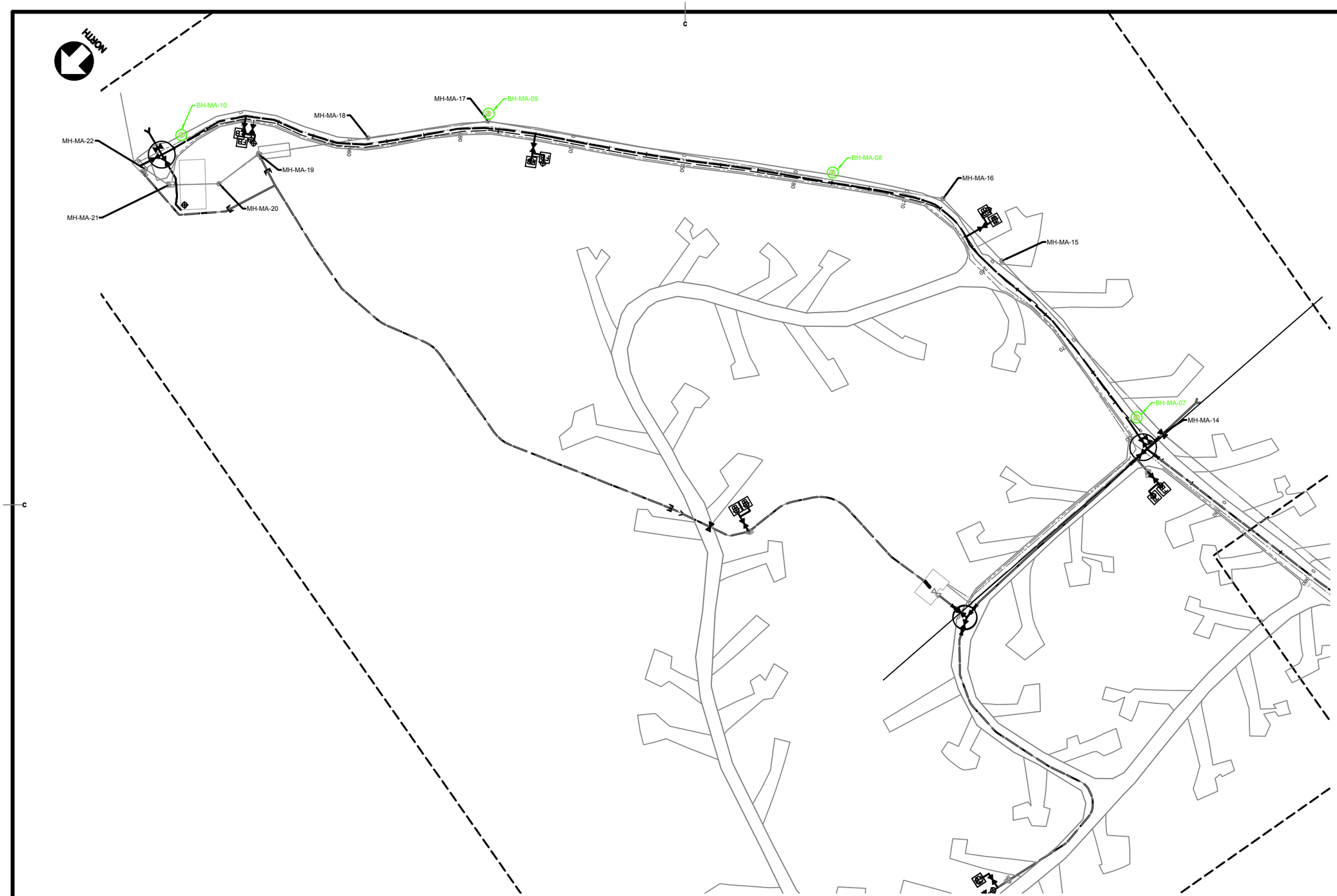
LOCATION: Newman Sound Campground N 5380608 E 280274

COMPLETED ON: 20/03/2019 **DWN:** S.B. **CHK'D:**

EQUIP./METHOD: Mini Excavator / Borehole

DEPTH ft	DEPTH m	ELEV. (ft)	STRATUM SYMBOL	SUBSURFACE DESCRIPTION	SAMPLES TYPE / No.	SAMPLES TEST VALUE
		16.9				
0.5		16.8		Dark brown, TOPSOIL and ROOTMAT.		
1.0				Brown, silty SAND with gravel (SM); occasional to some cobble. [Glacio-Fluvial TILL]		
1.5	0.5					
2.0						
2.5						
3.0						
	1.0					
3.5						
4.0		15.7		**End of Percolation Test at 1.22 m depth** *Free draining clean material. t value of 5 assigned.*		
4.5						
5.0	1.5					
5.5						
6.0						
6.5	2.0					
7.0						
7.5						
8.0	2.5					
8.5						
9.0						
9.5						
	3.0					

Appendix 2 Site Plan



PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

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MISSING MANHOLES

BOREHOLES

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revisions		date

project / projet

MALADY HEAD CAMPGROUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

drawing / dessin

MALADY HEAD CAMPGROUND PLAN 1

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2017-11-30
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2017-11-30
approved / approuvé: JULIEN BABIN, P.ENG.
date: 2017-11-30
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 601
drawing no. / no. du dessin: C02

ANSI D

E-DRM/GDD-E: 000000 VERSION 0

PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

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project / projet

MALADY HEAD CAMPGROUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

drawing / dessin

MALADY HEAD CAMPGROUND PLAN 3

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2017-11-30

drawn / dessiné: SUZANNE ALLAIN, CET
date: 2017-11-30

approved / approuvé: JULIEN BABIN, P.ENG.
date: 2017-11-30

Tender / Soumission

PCA Project Manager / Administrateur de projets APC

project number / no. du projet: 601

drawing no. / no. du dessin: C04

ANSI D

E-DRM/GDD-E: 000000 VERSION 0

PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

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MALADY HEAD CAMPGROUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

drawing / dessin

MALADY HEAD CAMPGROUND PLAN 4

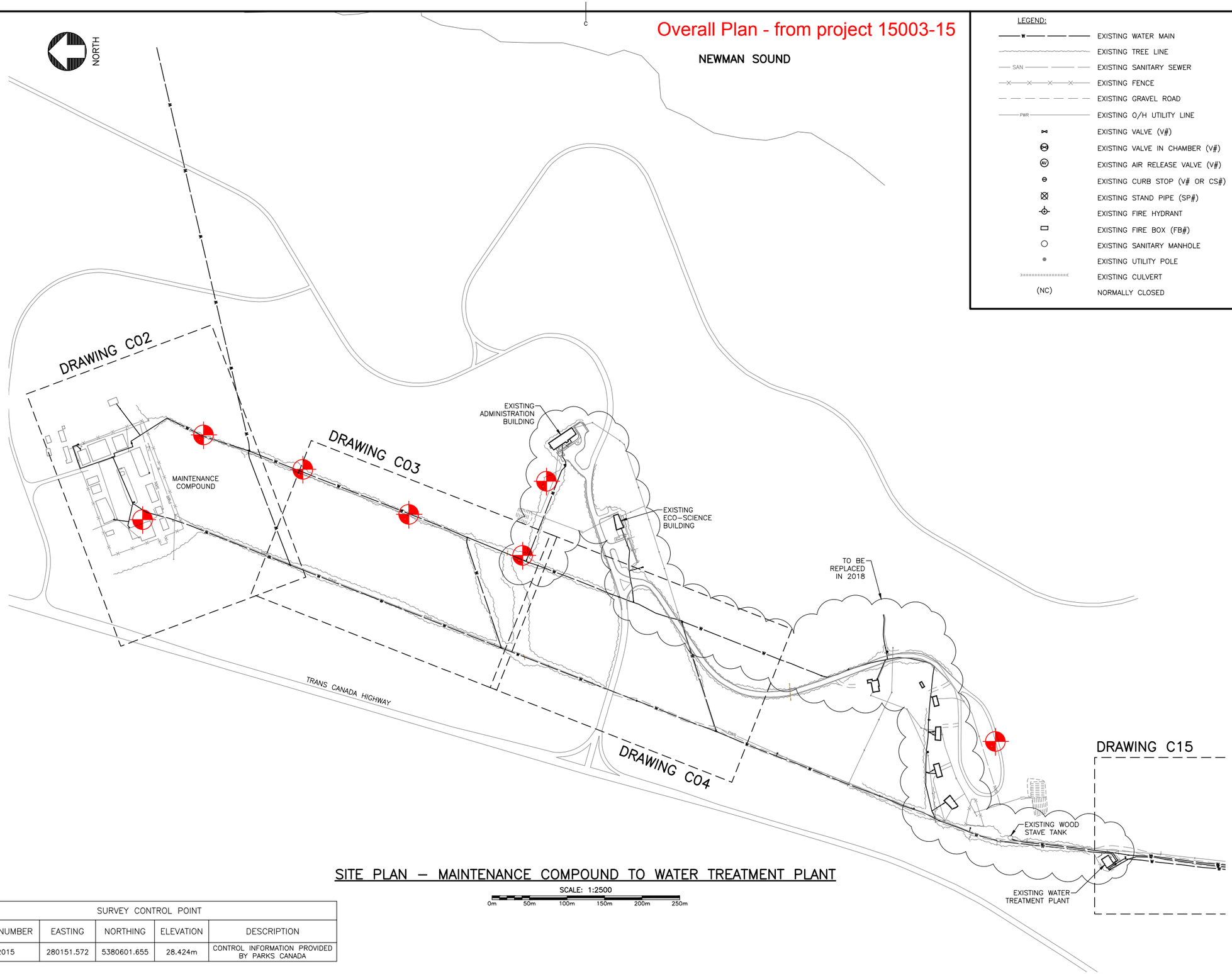
designed / conçu: ANDREW MELANSON, P.ENG.
date: 2017-11-30
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2017-11-30
approved / approuvé: JULIEN BABIN, P.ENG.
date: 2017-11-30
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 601
drawing no. / no. du dessin: C05

ANSI D

E-DRM/GDD-E: 000000 VERSION 0

Overall Plan - from project 15003-15

NEWMAN SOUND



SITE PLAN – MAINTENANCE COMPOUND TO WATER TREATMENT PLANT

SURVEY CONTROL POINT				
POINT NUMBER	EASTING	NORTHING	ELEVATION	DESCRIPTION
1–2015	280151.572	5380601.655	28.424m	CONTROL INFORMATION PROVIDED BY PARKS CANADA

LEGEND:

- EXISTING WATER MAIN
- EXISTING TREE LINE
- EXISTING SANITARY SEWER
- EXISTING FENCE
- EXISTING GRAVEL ROAD
- EXISTING O/H UTILITY LINE
- EXISTING VALVE (V#)
- EXISTING VALVE IN CHAMBER (V#)
- EXISTING AIR RELEASE VALVE (V#)
- EXISTING CURB STOP (V# OR CS#)
- EXISTING STAND PIPE (SP#)
- EXISTING FIRE HYDRANT
- EXISTING FIRE BOX (FB#)
- EXISTING SANITARY MANHOLE
- EXISTING UTILITY POLE
- EXISTING CULVERT
- (NC) NORMALLY CLOSED

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NOTES:

1. UNDERGROUND ELECTRICAL NOT SHOWN ON DRAWINGS.

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project / projet

NEWMAN SOUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

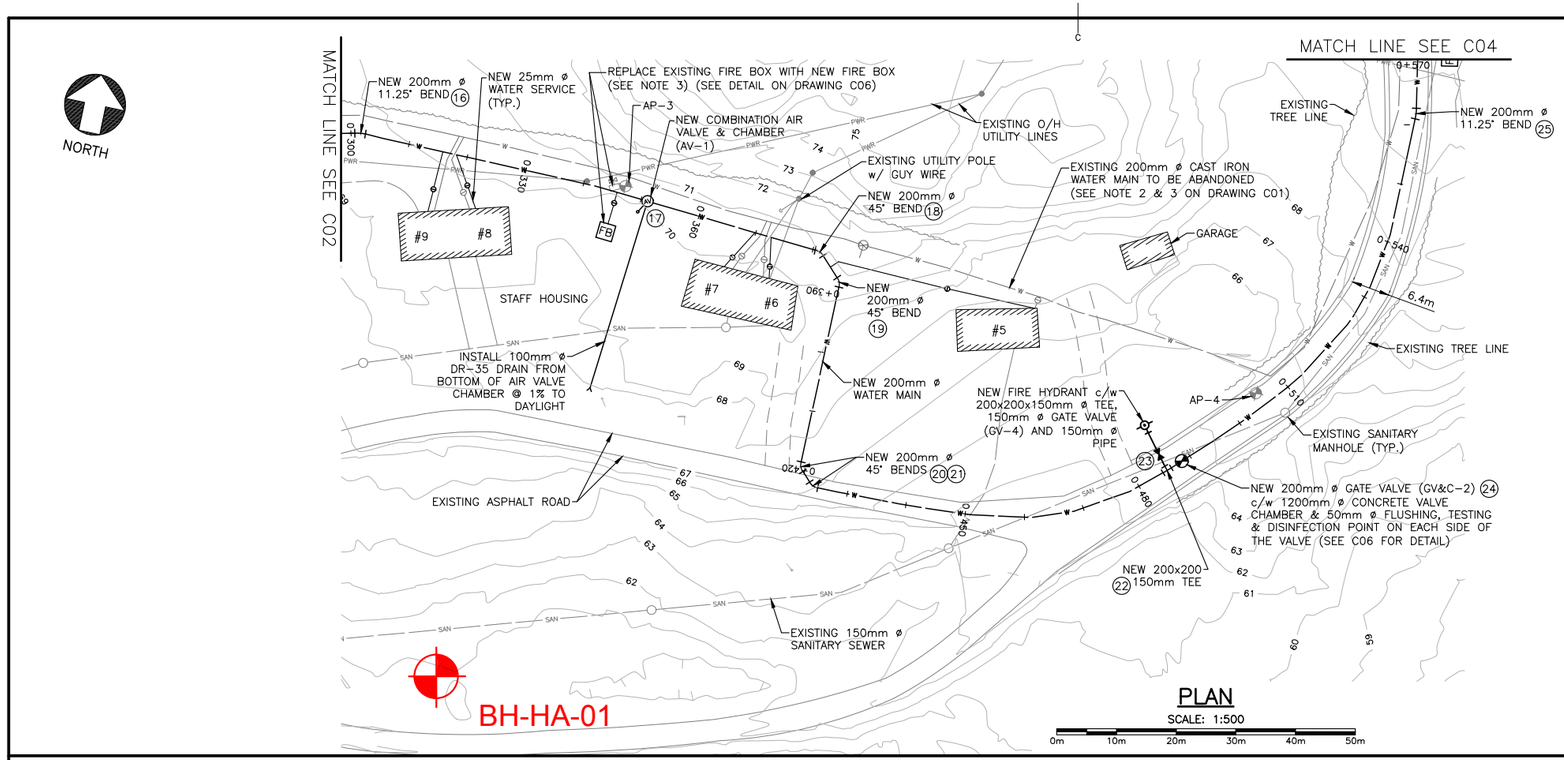
TERRA NOVA NATIONAL PARK

drawing / dessin

SITE PLAN – MAINTENANCE COMPOUND TO WTP

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2018–10–05
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2018–10–05
approved / approuvé: MIKE ROGERS, P.ENG.
date: 2018–10–05
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 617
drawing no. / no. du dessin: C01A

ANSI D

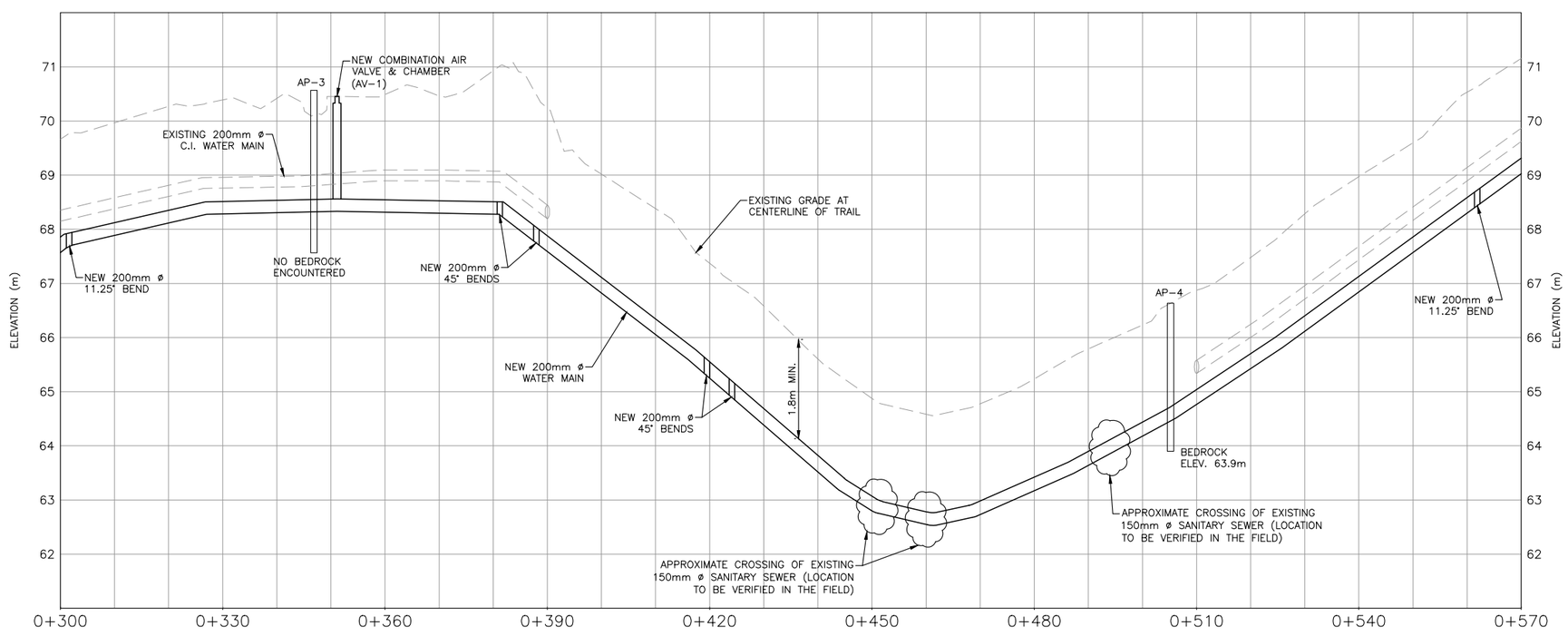


PLAN

SCALE: 1:500

from project 15003-17

BEND AND VALVE COORDINATES			
POINT #	NORTHING	EASTING	DESCRIPTION
16	5381425.3012	280129.9628	11.25° BEND
17	5381424.1116	280179.4550	AV-1
18	5381421.7471	280209.4450	45° BEND
19	5381417.4798	280213.6756	45° BEND
20	5381385.8685	280213.7960	45° BEND
21	5381383.1744	280216.4479	45° BEND
22	5381397.9918	280273.9906	TEE
23	5381400.3377	280272.0673	GV-4
24	5381400.0158	280276.0698	GV&C-2
25	5381465.0888	280302.4601	11.25° BEND



PROFILE

HORIZONTAL SCALE: 1:500

VERTICAL SCALE: 1:50

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NOTES:

1. SEE GENERAL NOTES AND LEGEND ON DRAWING C01.
2. ROADWAYS TO BE MILLED (OUTSIDE OF PIPE TRENCH) AND RE-PAVED FULL WIDTH IN AREAS WHERE WATER MAIN IS REPLACED UNDER THE ROAD. SEE DETAIL ON DRAWING C07.
3. EXISTING FIRE BOX AND/OR HYDRANT TO BE REMOVED FOLLOWING THE COMMISSIONING OF THE NEW FIRE BOX AND/OR HYDRANT.

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To practice Professional Engineering in Newfoundland and Labrador. Permit No. as issued by PEGNL KOA42 which is valid for the year 2018

LICENSED PROFESSIONAL ENGINEER 08260 Julien Babin NEWFOUNDLAND & LABRADOR
SIGNATURE
Oct 4, 2018
DATE

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0.1	ISSUED FOR TENDER	10/04 2018
0.0	ISSUED FOR TENDER	09/21 2018

project / projet

WATER DISTRIBUTION MAIN REPLACEMENT – PUMPHOUSE TO ADMINISTRATION BUILDING

TERRA NOVA NATIONAL PARK

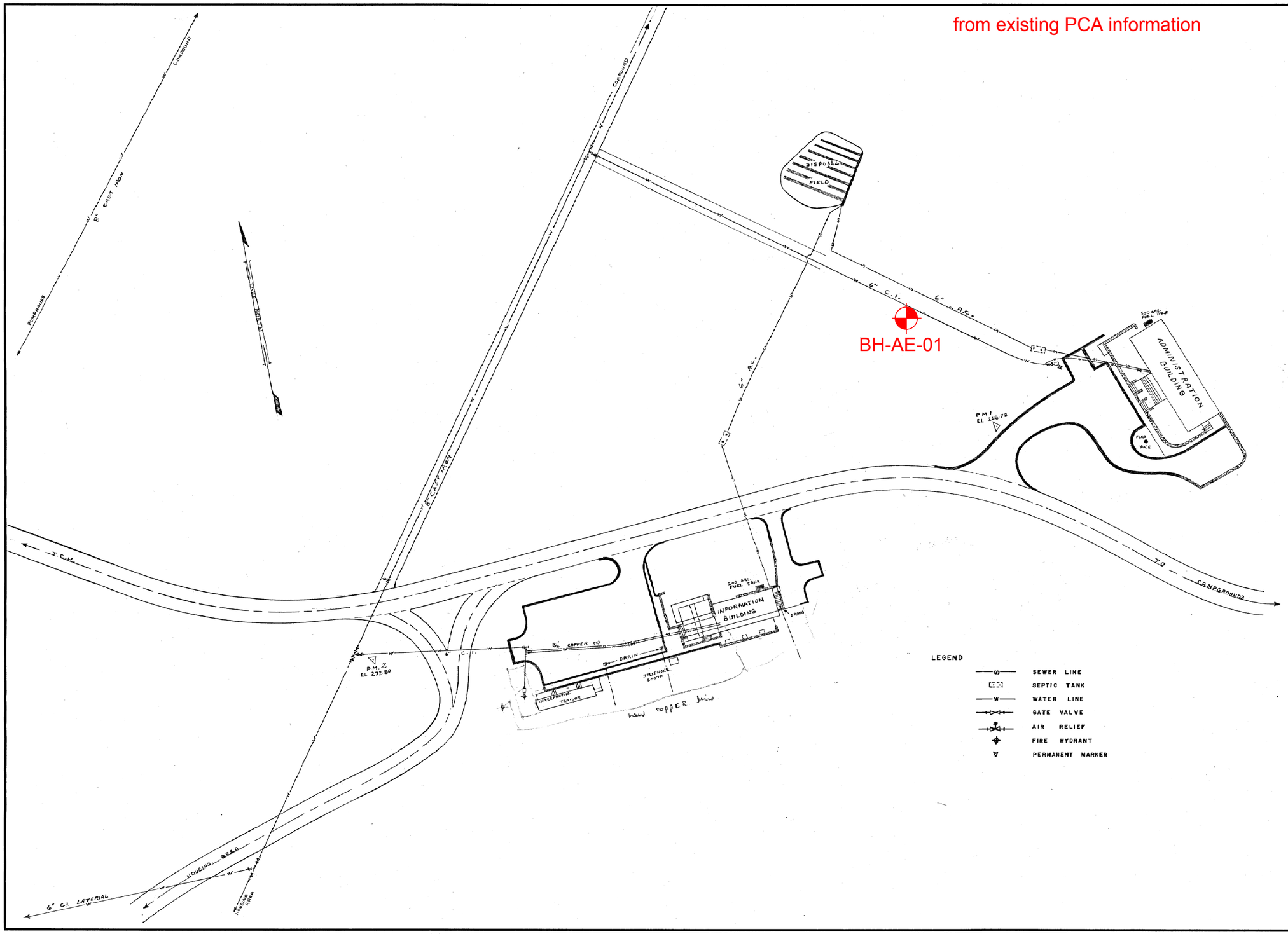
drawing / dessin

PLAN AND PROFILE 0+300 TO 0+570

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2018-09-21
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2018-09-21
approved / approuvé: JULIEN BABIN, P.ENG.
date: 2018-09-21
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 617
drawing no. / no. du dessin: C03

ANSI D

from existing PCA information



Indian and Northern Affairs / Affaires indiennes et du Nord

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A detail no. / détail no
B location dwg. no. / sur dessin no
C drawing no. / dessin no

drawn by / tracé par: B. WAY
scale / échelle: 1" = 40'
designed by / établi par
checked by / vérifié par
job captain / chef du projet | date
responsible officer / officier responsable | date: MAR. 1978

project title / titre du projet

drawing title / titre du dessin

ADMINISTRATION
INFORMATION
WATER & SEWER
AS — BUILT

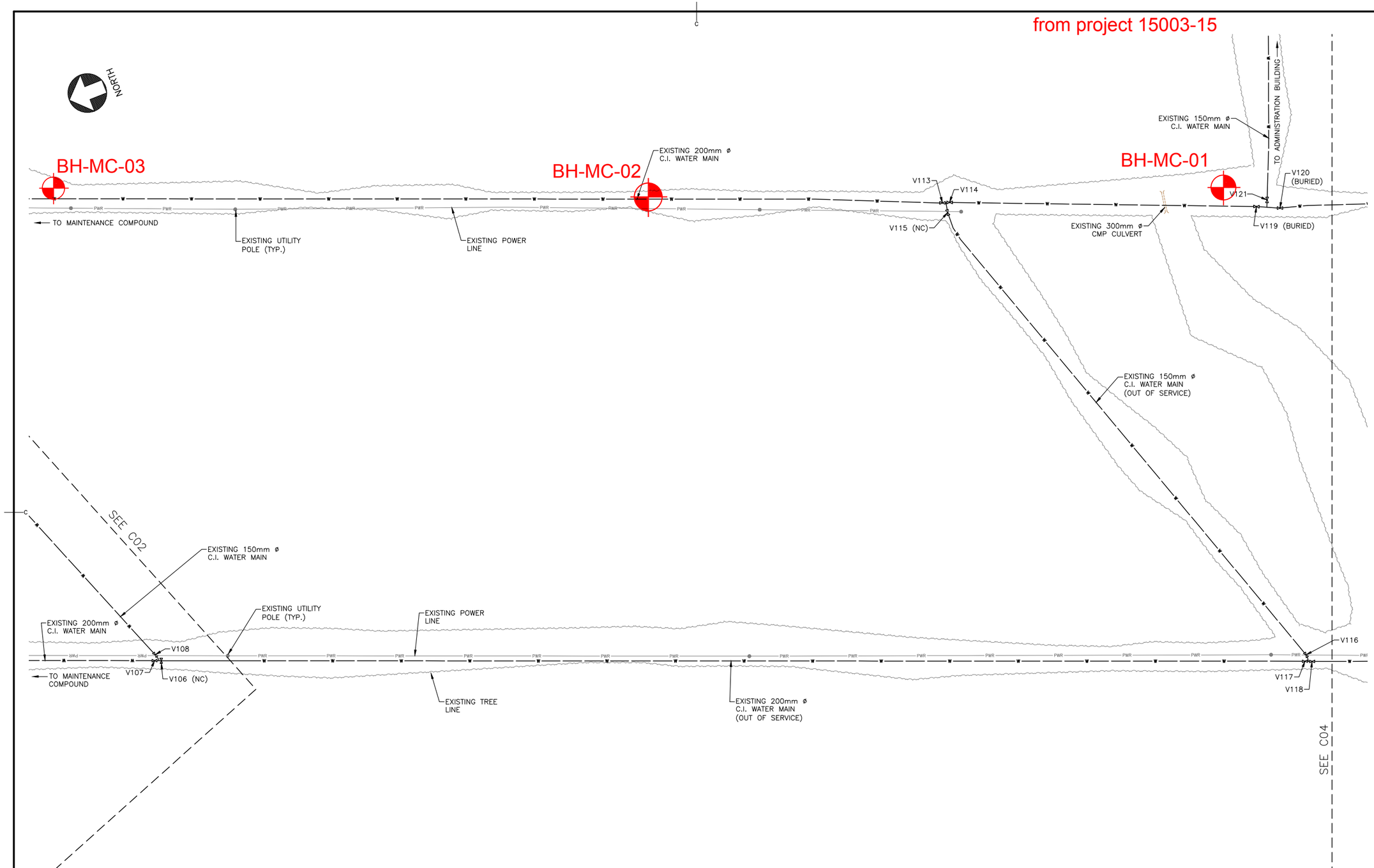
reference no. / no de référence: TNNP - 77
dwg no. / dessin no: 1/4

NATN 78/ P6/1

AS BUILT

#20

IAND 55-82 (5-72) 7530-21-029-1219



PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

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project / projet

NEWMAN SOUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

TERRA NOVA NATIONAL PARK

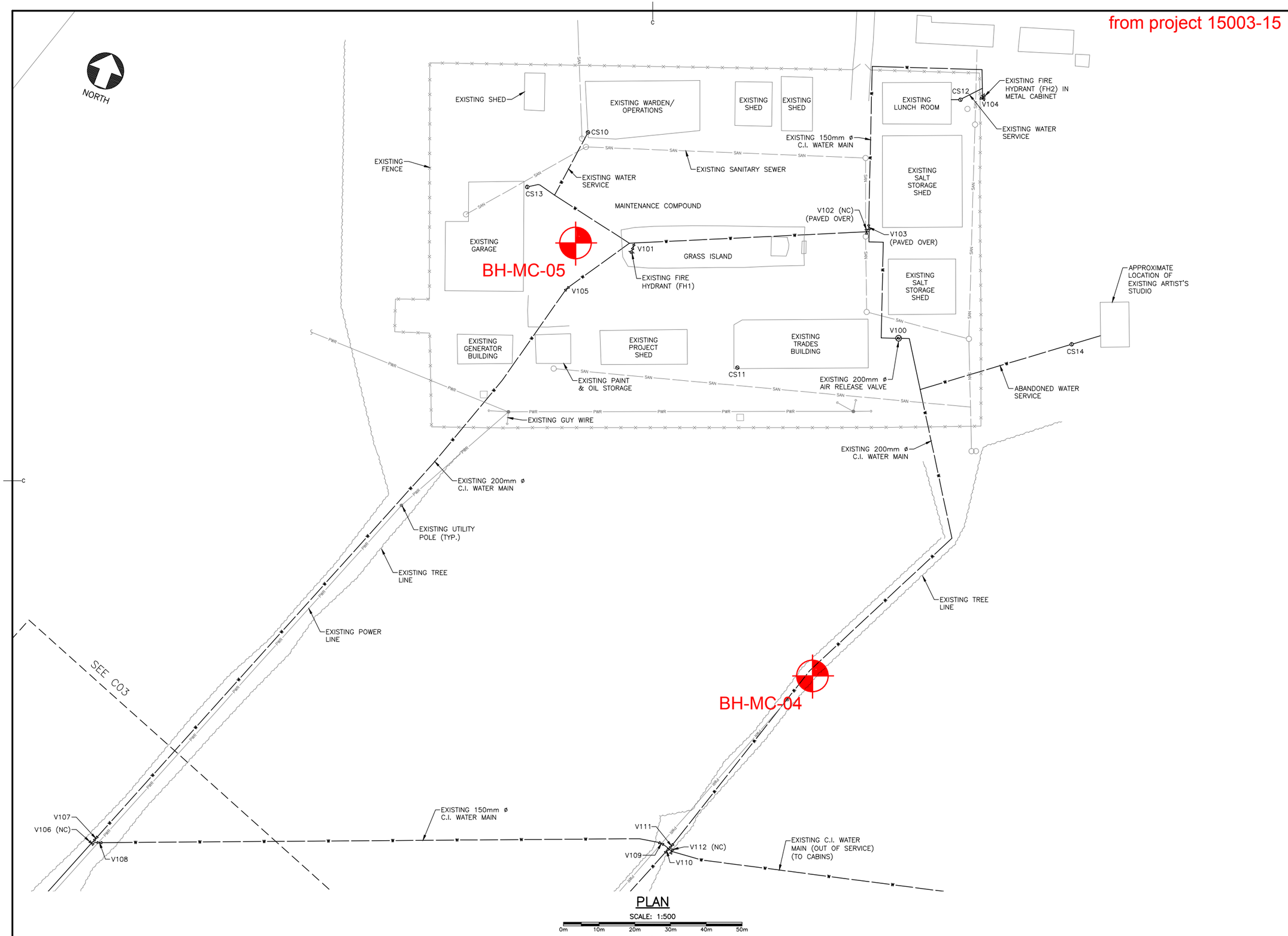
drawing / dessin

ADMINISTRATION BUILDING AREA 1

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2018-10-05
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2018-10-05
approved / approuvé: JULIEN BABIN, P.ENG.
date: 2018-10-05
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 617
drawing no. / no. du dessin: C03

ANSI D

from project 15003-15



PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

ANSI D

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revisions		date
0	CONDITION ASSESS. REPORT	10/05 2018

project / projet

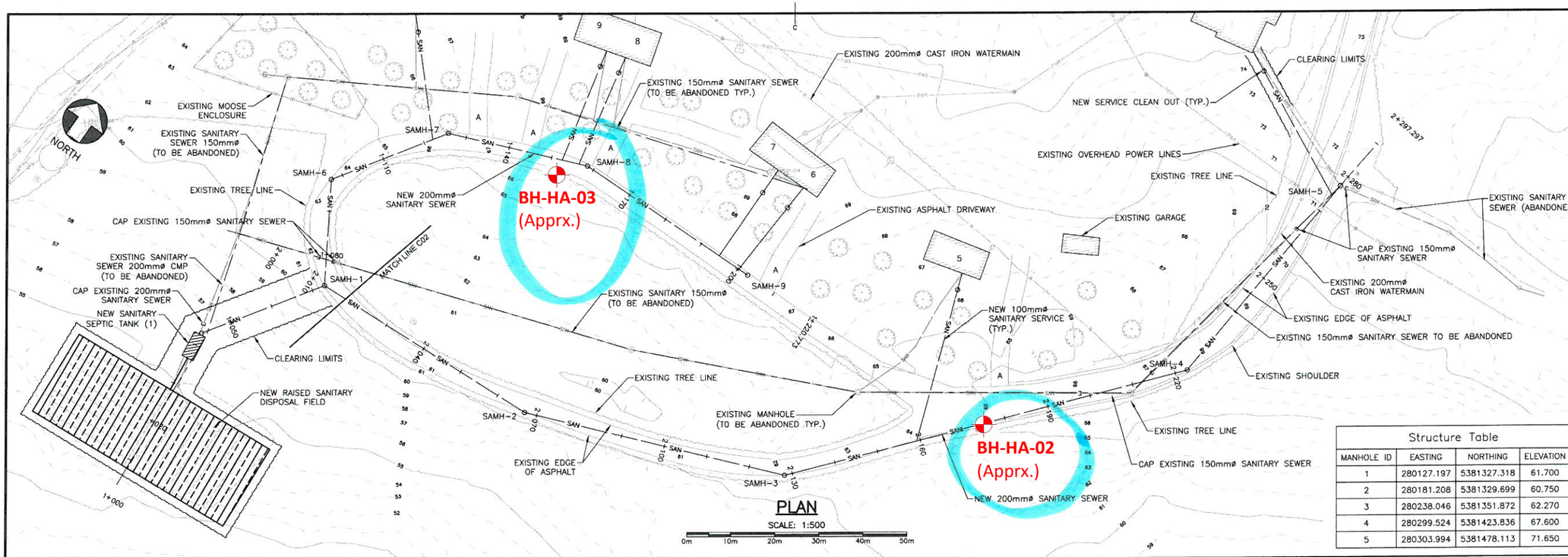
NEWMAN SOUND WATER DISTRIBUTION SYSTEM RECAPITALIZATION

TERRA NOVA NATIONAL PARK

drawing / dessin

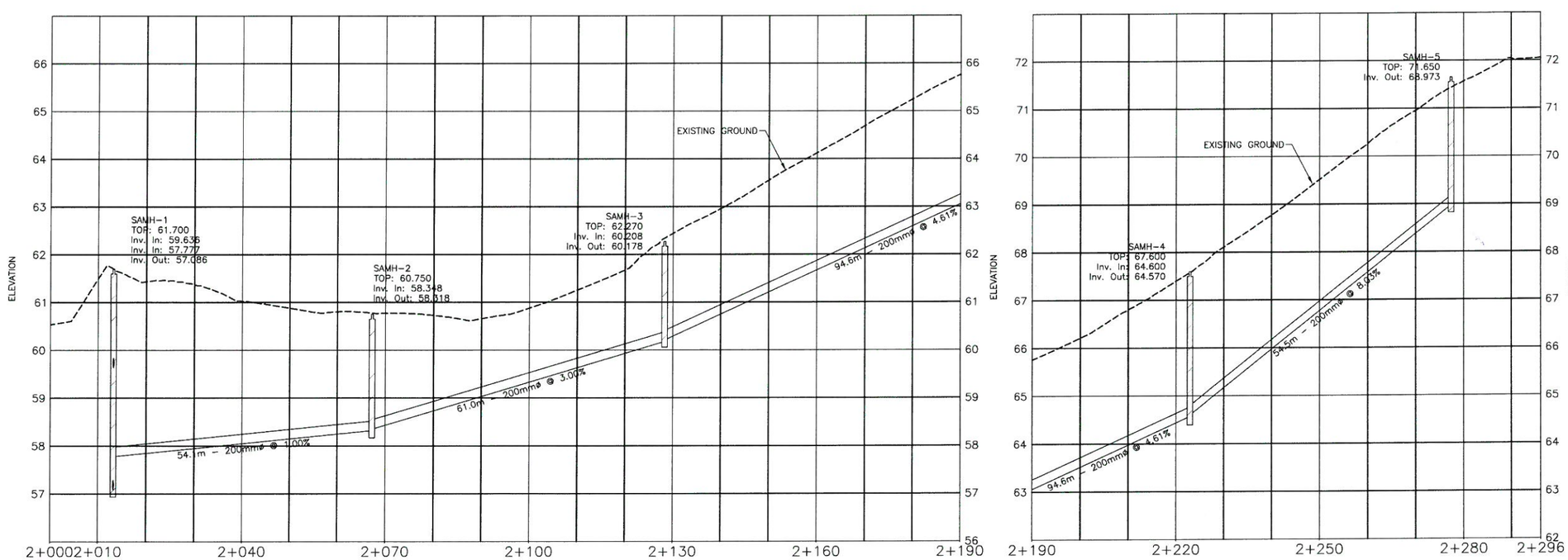
MAINTENANCE COMPOUND

designed / conçu: ANDREW MELANSON, P.ENG.
date: 2018-10-05
drawn / dessiné: SUZANNE ALLAIN, CET
date: 2018-10-05
approved / approuvé: JULIEN BABIN, P.ENG.
date: 2018-10-05
Tender / Soumission
PCA Project Manager / Administrateur de projets APC
project number / no. du projet: 617
drawing no. / no. du dessin: C02



PLAN

Structure Table			
MANHOLE ID	EASTING	NORTHING	ELEVATION
1	280127.197	5381327.318	61.700
2	280181.208	5381329.699	60.750
3	280238.046	5381351.872	62.270
4	280299.524	5381423.836	67.600
5	280303.994	5381478.113	71.650



PROFILE

HORIZONTAL SCALE: 1:500 (0m 10m 20m 30m 40m 50m)

VERTICAL SCALE : 1:50 (0m 1m 2m 3m 4m 5m)

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NOTES:

1. SEE GENERAL NOTES AND LEGEND ON DRAWING C01.
2. ALL CLEARING LIMITS SHOWN ARE MAXIMUM. CONTRACTOR TO USE TRENCH BOXES AS NEEDED TO MINIMIZE REQUIRED CLEARING.

revisions		date
0	ISSUED FOR 66% REVIEW	03/22 2019

project / projet

ADMINISTRATION AND HOUSING AREA WASTEWATER

TERRA NOVA NATIONAL PARK

drawing / dessin

HOUSING AREA SANITARY SEWER PLAN AND PROFILE VIEW STA. 2+000 TO STA. 2+296

designed / conçu: D. PHILLIPS — date: 2019-03-22

drawn / dessiné: D. PHILLIPS — date: 2019-03-22

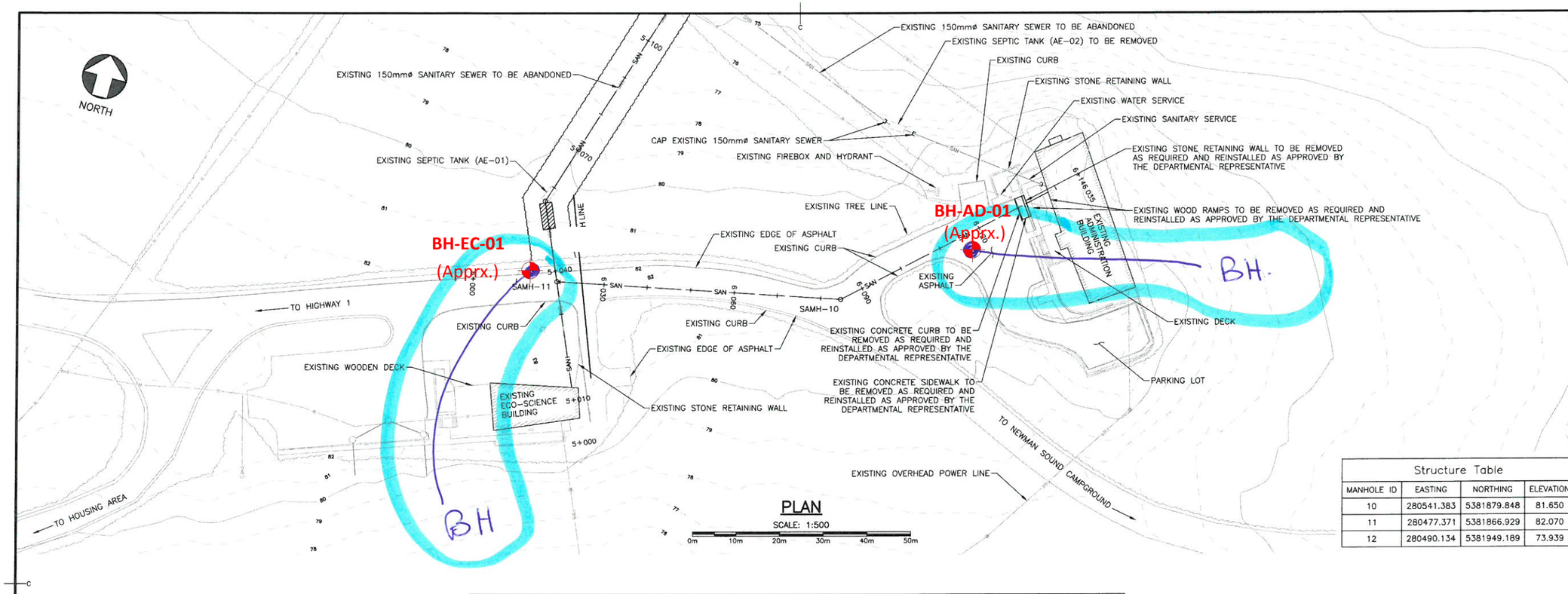
approved / approuvé: C. GALLANT — date: 2019-03-22

Tender / Soumission

PCA Project Manager / Administrateur de projets APC

project number / no. du projet: 123456

drawing no. / no. du dessin: C03

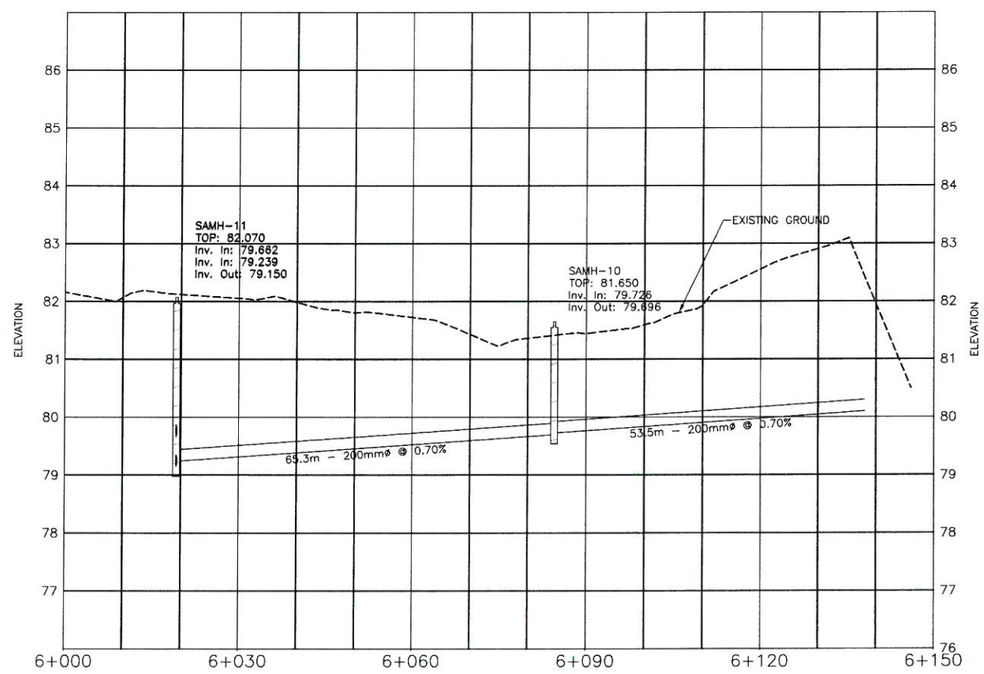


PLAN

SCALE: 1:500

0m 10m 20m 30m 40m 50m

Structure Table			
MANHOLE ID	EASTING	NORTHING	ELEVATION
10	280541.383	5381879.848	81.650
11	280477.371	5381866.929	82.070
12	280490.134	5381949.189	73.939



PROFILE

HORIZONTAL SCALE: 1:500

0m 10m 20m 30m 40m 50m

VERTICAL SCALE : 1:50

0m 1m 2m 3m 4m 5m

ANSI D

Parks Canada Parcs Canada

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CRANDALLENGINEERING.CA

revisions		date
0	ISSUED FOR 66% REVIEW	03/22/2019

project / projet

ADMINSTRATION AND HOUSING AREA WASTEWATER

TERRA NOVA NATIONAL PARK

drawing / dessin

ADMINISTRATION BLDG. SANITARY ALIGNMENT #5 PLAN AND PROFILE VIEW STA. 6+000 TO STA. 6+150

designed / conçu: J. DOE
date: YYYY-MM-DD

drawn / dessiné: J. DOE
date: YYYY-MM-DD

approved / approuvé: J. DOE
date: YYYY-MM-DD

Tender / Soumission

PCA Project Manager / Administrateur de projets APC

project number / no. du projet: 123456

drawing no. / no. du dessin: C05

APPENDIX B – SEWER MAIN LEAKAGE TEST

APPENDIX B: SEWER MAIN LEAKAGE TEST

SEWER MAIN LEAKAGE TEST

GENERAL INFORMATION			
PROJECT:	_____	DATE:	_____
PROJECT No.:	_____	CONTACTOR:	_____
JOB LOCATION:	_____	CONTACTOR'S REP:	_____
	_____	INSPECTOR:	_____
TEST LOCATION:	_____	TYPE OF PIPE:	_____ CLASS _____

ALLOWABLE EXFILTRATION: AIR TEST		
D = DIAMETER OF PIPE (mm)		
F = LOSS FACTOR	0.0987 for no ground water above top of pipe 0.0900 for 1 m ground water above top of pipe 0.0827 for 2 m ground water above top of pipe 0.0765 for 3 m ground water above top of pipe 0.0711 for 4 m ground water above top of pipe	
TA = ALLOWABLE TIME:	_____	TA = 15 D F (SECONDS)

TEST RESULTS: AIR TEST	
Tt = TIME FOR AIR PRESSURE TO DROP FROM 25 kPa (3.6 psi) to 15 kPa (2.2 psi)	
Tt = _____	IF Tt > TA = PASS □ IF Tt < TA = FAIL □

Conversion Factors:
1 inch = 25.4 mm
1 psi= 6.94 kPa
1 imp. Gal. = 4.54 liters

COMMENTS_____

_____

_____

_____ INSPECTOR'S SIGNATURE

_____ FOREMAN'S SIGNATURE

APPENDIX C – MANHOLE VACUUM TEST

APPENDIX C: MANHOLE VACUUM TEST

MANHOLE VACUUM TEST

GENERAL INFORMATION

DATE: _____

CONTRACTOR: _____

CONTRACTOR'S REP: _____

CRANDALL INSPECTOR: _____

OTHERS: _____

PROJECT: _____

LOCATION: _____ MANHOLE No.: _____

D= MANHOLE DIAMETER _____ (m) H= HEIGHT OF MANHOLE _____ (m)

SANITARY MANHOLE VACUUM TEST - ALLOWABLE TIME

THE ALLOWABLE TIME IS 2 MINUTES, REGARDLESS OF MANHOLE DIAMETER, DEPTH AND GROUNWATER. THE MANHOLE SHALL PASS IF THE TIME FOR THE VACUUM TO DROP MEETS OR EXCEEDS 2 MINUTES (*see next page*).

ALLOWABLE TIME

TALL = 2 MINUTES

SANITARY MANHOLE VACUUM TEST RESULTS

T1 = TIME STARTED AT 33.8 kPa (4.9 psi): _____ IF TACT > TALL IF TACT < TALL

T2 = TIME STOPPED AT 30.4 kPa (4.4 psi): _____

TACT= ACTUAL TIME = T2 - T1 _____ PASS □ FAIL □

COMMENTS_____

_____

_____

_____

_____ _____

INSPECTOR'S SIGNATURE FOREMAN'S SIGNATURE

APPENDIX C: MANHOLE VACUUM TEST (Cont'd)

Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test ASTM C1244 – 04

- Conduct testing one manhole at a time
- All lift holes shall be plugged, pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
- The test head shall be placed at the top of the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 30.4 kPa of HG.
- The manhole shall pass if the time for the vacuum reading to drop from 33.8 kPa of Hg to 30.4 kPa of Hg meets or exceeds the standard two (2) minute test time.

APPENDIX D – CLOSED CIRCUIT VIDEO INSPECTION

APPENDIX D: CLOSED CIRCUIT VIDEO INSPECTION

EQUIPMENT:

The Supplier must provide equipment meeting the following requirements:

- Self – contained monitoring unit complete with pan/tilt/zoom digital camera capability with remotely controlled lighting system capable of varying the illumination of the interior of the sewer line for inspection and photographic purposes.
- Minimum camera resolution must be 640 x 480 and show the entire periphery of pipe.
- CCTV video is to be recorded directly in a DVD format.
- Video file format must be MPEG 2 encoded, Regional Code 1 and comply with the NTSC (National Television Standards Committee).
- Supplier must be able to video pipe sizes ranging from 150 mm diameter up to 1,800 mm diameter inclusively.

DEFINITION OF FAULT:

- Any sewer pipe joint which displays a gap or spread, offset, gasket, or signs of infiltration.
- Any service lateral which displays water infiltrating around service connections, any service lateral exhibiting pronounced protrusion into the sewer line or any active or abandoned service lateral.
- Any section of sewer which is crushed, broken or displays longitudinal or circumferential cracks (other than hairline cracking), which displays a gap/spread, offset or signs of infiltration.
- Any variance in grade, alignment or diameter of sewer line section.
- Any gravel, roots, or foreign material which may impede flow.
- Any deformation in the shape of the pipe.
- Any section of sewer displaying standing water.
- Any material change or spot repair.

INSPECTION:

- Perform inspection of pipe from manhole to manhole by passing CCTV camera through sewer preferably in the direction of flow, according to line conditions at the time inspection is made.
- The inspection shall be performed on one (1) sewer line at a time by transporting the CCTV camera through the line along the axis of the pipe.
- All fault will be inspected using the pan and tilt feature of the camera. Continuous faults shall be inspected using the pan and tilt feature at intervals so as to provide a representative of that fault.

APPENDIX D: CLOSED CIRCUIT VIDEO INSPECTION (Cont'd)

RECORDS:

- Maintain inspection report during CCTV inspection.
- Report to include location of each fault and service laterals with their respective distance measured from centerline of reference manhole and clock position referenced to axis of pipe. Report to also include pictures of significant defects (severely deteriorated pipe, severely protruding lateral, etc.)
- At the start of each sewer main inspection, the following information shall be recorded in the DVD:
    - Date, time and weather conditions;
    - Location (street, civic address, etc.);
    - Pipe type (combined, sanitary or storm);
    - Pipe size;
    - Pipe material;
    - Pipe ID;
    - From Manhole ID;
    - To Manhole ID;
    - Direction of travel (upstream, downstream);
    - Survey number;
    - Any other information that may be pertinent to the work.
- The pipe ID shall be displayed on the screen at all times during the inspection for quick reference.
- On screen display to clearly identify exact location of camera in meters.

REPORTS:

- The inspection report shall be in PDF.
- A paper copy of the report is to be submitted with the PDF files.

ACCURACY:

- Pipe diameter shall be estimated within plus or minus one (1) nominal pipe size for all sizes of sewers outlined in these Specifications.
- Maximum permissible error in location of faults and service laterals with their respective distance measured from centerline of reference manhole to be within a one (1) meter tolerance.

DVD'S:

- Supply a complete record of all CCTV video inspections on DVD.
- Label all DVD's, listing streets and corresponding pipe ID's inspected.
- DVD shall include a main menu with a chapter for each individual inspection. Chapter to be labeled by Street and Pipe ID.

APPENDIX E – BASIC IMPACT ANALYSIS